AN ANALYSIS OF THE
DEFENSE LOGISTICS AGENCY
MEDICAL SUPPLIES REQUISITION PROCESS

THESIS

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The views expressed in this thesis are those of the authors and do not reflect the official policy or position of the Department of Defense or the U.S. Government.

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Acknowledgments

> Do not keep the alabaster boxes of your love and tenderness sealed up until your friends are dead. Fill their lives with sweetness. Speak approving, cheering words while their ears can hear them, and while their hearts can be thrilled and made happier by them.
>
> -George William Childs

To my family and friends whose words of encouragement and acts of kindness enabled me to complete this project, THANKS, YOU WERE WONDERFUL!

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Sandy

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Abstract

Defense reorganization initiatives coupled with demands for significant cost reductions exerted tremendous operating pressures on the Defense Logistics Agency (DLA). DLA senior management focused on process management as an approach to simultaneously assure appropriate levels of customer service and cost. The first step in this approach was to fully understand current management processes. As such, the thesis objective was to document the medical supplies order cycle process by tracing the path of information through the logistics pipeline.

Detailed flowcharts and narrative descriptions were employed to demonstrate the activities of those organizations responsible for processing Air Force orders for medical supplies. Pipeline objectives and measurements were identified and their implications assessed. The process analysis was facilitated by an extensive literature review of operating policies and in-depth personal interviews with technicians, supervisors, and managers working at all stages of the medical logistics pipeline.

Research conclusions included: (1) the absence of a process owner; (2) a weak communications network attributable to poor computer systems integration; (3) key pipeline measurements and management reports focused on functional responsibilities rather than system-wide customer

service; (4) processing standards were driven by peacetime operations and ill-adapted to contingency operations.

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I. Introduction

Overview

In February 1989 President George Bush tasked the Secretary of Defense to conduct a comprehensive review of defense management practices and to identify efficiencies and economies which could be achieved (Arthur, 1990). That summer, Secretary of Defense Dick Cheney responded with the Defense Management Report (DMR) to the President which included six broad objectives: reduce costs while maintaining military strength, improve weapon system performance, revitalize the department's planning, programming and budgeting process, reduce micromanagement strengthen the defense industrial base, and improve observance of ethical standards in government and industry. As a result of the DMR, a long list of potential cost savings were identified in 38 Defense Management Report Decisions. (Arthur, 1990).

A major goal of the DMR was to reduce the budget, with the primary focus on reducing the cost of the support infrastructure. Study groups were tasked to research ways to further streamline or consolidate supply depots, maintenance depots, inventory control points, and automated data processing centers and operations. Like many American corporations, the Department of Defense (DOD) was looking for means to improve the way they do business. "In corporate terms, the DOD is reducing overhead in an effort to be more competitive" (Arthur, 1990:6).

Background

"The annual cost to run the DOD supply system approaches $27 billion" (Stone, 1990:8). Included in these costs are the material costs to procure spare parts, transportation costs to position the material, and the associated operating costs at the inventory control points and wholesale stock points. However, by decree of Defense Management Report Decision (DMRD) 901, those costs are to be reduced three percent per year starting in FY91, leading to a fifteen percent reduction by FY95 (Stone, 1990). To live within those guidelines, supply agents must employ effective and economical business practices to operate their logistical systems.

The DOD supply system now has "over $32 billion in secondary item (spares and repair parts, consumable supplies, provisions and clothing) inventory on hand" (Mitchell, 1990:24). Although there are numerous explanations for this accumulation of inventory, Congress and the DOD decided the methods to control it must be improved. On 21 May 1990, the DOD Inventory Reduction Plan was announced. The purpose of the plan was to force improvements in the logistics system so that current readiness levels can be maintained with smaller inventories.

> The thrust of this plan is to reduce the number of new items entering and cataloged in the federal system, to improve visibility of material already held, to use innovative procurement techniques that foster shorter lead times and lower stocking levels, and to reduce the quantity of stock held. (Mitchell, 1990:26)

Defense Logistics Agency (DLA). The current operating environment makes it imperative DLA be concerned with the performance of the processes over which they have responsibility, especially since those responsibilities are increasing. Concerned that single-manager agencies of the services were not providing uniform supply procedures, in 1961 Secretary of Defense Robert McNamara established the Defense Supply Agency (DSA). Supply centers were consolidated, and the agency was given the mission of operating certain DOD programs which supported all the military services. Those responsibilities increased in the mid 1960s when the Defense Contract Administration Service organization was established under DSA (DLA, 1991b).

In the early 1970s the responsibility for overseas wholesale food stocks and bulk fuel stocks were added, and in the mid 1970s the name was changed to Defense Logistics Agency. A few years later the agency's responsibilities were broadened to include surplus materiel disposal overseas. When the agency first began operation it was responsible for 1.2 million supply items, but that number now includes 2.9 million of the 4.5 million supply items used by the military services. As a result of recent DMR decisions, DOD directed that DLA assume responsibility for the remaining items (DLA, 1991b).

One of the supply systems faced with streamlining their operation was the medical logistics system. A medical logistics system is critical to those it serves during peace, transition, and contingency or wartime operations. Daily, somewhere around the globe, life and death situations are affected by medical readiness. Yearly, the military services purchase and distribute over $2 billion of medical supplies and equipment to provide healthcare during peacetime (CIM, 1990).

Defense Personnel Support Center (DPSC). DPSC located in Philadelphia, Pennsylvania, is the inventory control point for numerous items supplied by DLA. Annually, personnel at DPSC purchase about $3.5 billion worth of food, clothing, textiles, medicines and medical equipment at the wholesale level for the Armed Services and several federal agencies. In an average year the center handles approximately 13 million requisitions (DPSC, 1990). At DPSC, personnel in the Directorate of Medical Materiel purchase more than $800 million in medical supplies and equipment annually and control depot inventories (on hand or on order) valued at over $500 million (CIM, 1990).

The mission of the directorate is to provide world-wide supply, technical management, and acquisition of wholesale medical materiel for all military services. Its responsibilities include acquisition of non-stocked (local purchase) items for Army, Navy and Air Force units overseas and support to various civilian federal agencies within the continental United States. The directorate is responsible for national stock number (NSN) assignment, specifications, requirements, contracting, distribution, and standardization; in short, DPSC is responsible for all of the functions necessary to ensure a viable medical supply program (DPSC, 1991).

In the June 1991 issue of the Medical Materiel Customer Assistance Bulletin, "Lifeline," it was announced that local purchase services had been extended to customers within the continental United States (CONUS) also. Since much of the research for this thesis was concluded prior to that date, the process descriptions contained in Chapter IV are applicable for requisitions which flowed through the system until the end of May. The one change in system processing is indicated in the process description in Chapter IV. Medical Logistics personnel at Wright-Patterson Air Force Base had not taken advantage of the change as of 15 July.

According to directorate statistics, inventory on hand is valued at $592.4 million ($177.5 million in drugs), with an inventory turnover of 1.4 times per year (2.6 times for drugs). There are 66,263 NSNs managed by the Medical Materiel Directorate. Of the total FY90 sales of $813.1 million, $263.9 million was to the Air Force. Of the 1,688,645 requisitions received during FY90, 624,638 were from Air Force activities (DPSC, 1991). For FY1990, 87 percent of requisitions received at DPSC were for depot stock, and 90.2 percent of those were filled on the first attempt (Rees, 1991).

Healthcare is big business for the DOD, and costs are projected to increase dramatically during the years ahead (Hill, 1988). As a result of the implementation of DMRD 901, the surcharge DPSC adds to the cost of stocked items purchased by their customers increased from 9.5 to 19.3 percent in FY 1991. For FY 1990, 52.9 percent of the medical items purchased by the Air Force were procured locally, rather than through DPSC (Holland, 1991). As DPSC surcharges increase, the local purchase percentage is expected to increase. Therefore, the potential benefits of streamlining operations are integral to the survival of DPSC as the primary source of medical supplies and equipment for the Armed Services.

In the commercial arena, many progressive hospitals have moved toward Just-in-Time supply flow, and reduced their on-hand and on-order inventories to approximately twenty days. Military hospitals, however, have on-hand and on-order 60-120 days of supply (CIM, 1990).

Faced with increased responsibilities and customers with plunging funding levels, it is imperative DLA be concerned with controlling and improving their processes. Since medical supplies are critical to the well-being of DLA customers worldwide, a study of the medical logistics pipeline was appropriate.

General Issue

The DLA leadership recognized "the times of ample resources are past," (Cole, 1990) and determined they would focus their energies on specific issues which they felt were integral to improving their performance. Five strategic target areas were identified: (1) attracting and retaining quality people, (2) matching customer requirements with DLA capabilities to ensure customer satisfaction, (3) deploying information systems that meet user needs, (4) lowering costs and maximizing return on investment, and (5) building an effective relationship with industry (Filippi, 1990).

Quality Management Boards (QMBs) were established for each area, and board members were challenged to formulate and implement breakthrough strategies. These strategies were defined as innovative ways of achieving Agency goals which could be measured and tracked and would have dramatic impact. The boards also were tasked to set up process action teams (PATs) for each critical process. QMBs were told that DLA must continue to provide quality service to its customers even though expenditure of resources would decrease radically (Cole, 1990).

Figure 1 is an illustration of the model DLA is following to improve their performance. The vision of DLA management is improved performance despite decreasing funding levels. (Cole, 1990). As previously stated, target areas were identified, and QMBs were assigned responsibility for those areas. PATs were established for the critical processes within the target areas, and breakthrough strategies are being pursued. PATs possess the authority to implement process changes and institute control mechanisms.

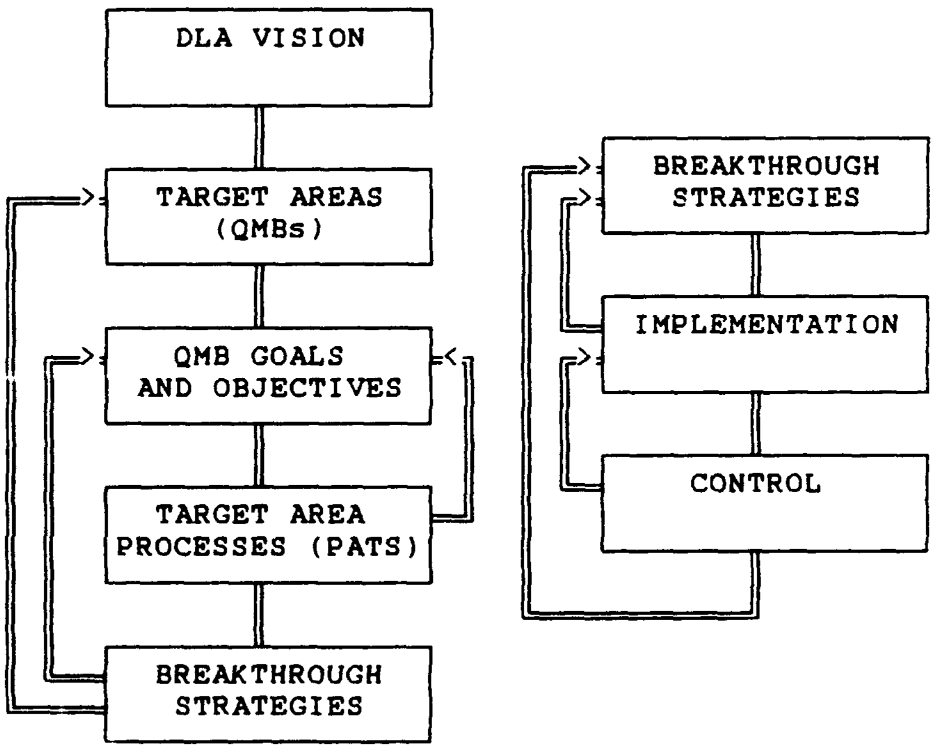


Figure 1. Flowchart of the Improvement Process (Filippi, 1990)

PATs are a tool advocated by the Total Quality Management philosophy adopted by the DOD. A PAT is a group organized for the express purpose "to improve quality and productivity by continually analyzing and measuring processes" (AFLC, 1989). The team is composed of a leader who is responsible for the overall direction of the group, a facilitator who is trained in group dynamics and leads the analysis effort, and team members who are experts in specific processes and assist in process analysis and developing recommended breakthrough strategies.

One QMB was charged to improve customer service, and the first process selected for review was medical supply support. A PAT was organized to conduct the analysis, and chartered to perform the following tasks:

1. Review current medical support processes and flowchart them.

2. Identify who the medical customers are.

3. Poll and analyze customers' views to identify better practices and prioritize/differentiate what the customers' service and product needs are.

4. Recommend process improvements to enhance customer satisfaction.

5. Evaluate the decision making process on what gets stocked and what is direct-vendor delivered.

6. Provide a method of gathering and analyzing performance through customer feedback and acting on that information to ensure DLA meets customer requirements. (DLA, 1991a)

The DLA Medical Process Action Team sponsored this research to assist them in the completion of tasks 1 and 4.

Specific Issue

What is the process used by DLA to provide medical supplies to its customers?

Research Objective

This thesis examined the flow of information in the medical supplies pipeline from the determination of requirement to receipt of the particular item by the customer. The objective was to document the process and identify potential areas of improvement.

Investigative Questions

The following questions were answered to address the specific issue:

1. What offices and organizations are involved in the medical supplies pipeline?

2. What is the flow of the process and what are the boundaries?

3. What are the procedures followed in the requisitioning of medical supplies?

4. What are the objectives of the process and how are they measured?

5. Are there performance standards, and how does current performance compare to those standards?

Scope and Limitations

> As we attempt to balance our resources and live within the constraints being imposed upon us, a clearer understanding of the pipeline and the

> impact of its policies and procedures would be extremely useful. It would be more productive, as a first step, to collectively define the pipeline and piece together what information is now regularly collected and used by managers. This will also give us insight into what information we don't have. We can then proceed from there. (Skipton, 1988)

The logistics pipeline may be defined as the flow of materiel and its associated information from acquisition to the customer. Research has indicated that it may be subdivided into four major subsystems: base-level, depot-level, acquisition, and disposal (Bond and Ruth, 1989:xi). To define the medical supplies pipeline, this thesis traced the information flow from the customer with a requirement, on to the source of supply, and back to the customer. Since medical supplies (operating inventory) are consumable, there is no disposal subsystem.

There are numerous Military Standard Logistics Systems within the DOD which impact the service provided to an agency's customers and the flow of information through the subsystems of the pipeline. Those systems which establish standards under which the requisitioning and subsequent movement of medical supplies must occur were addressed in this research.

This thesis analyzed the requisitioning system as it pertains to medical supplies (Class VIII), with no distinction given to war reserve materiel. Specifically, it followed the information flow of an expressed requirement from determination to customer receipt. Due to time constraints, the method for determining a specific requirement, and the physical movement of the requisitioned items were not addressed.

The Defense Personnel Support Center (DPSC) of DLA is responsible for providing medical supplies (including thousands of different drugs and medical, dental, and surgical materials) to the services and several other agencies. Each service/agency uses a different system for passing their requisitions to DPSC. Since time constraints made it impossible to analyze all of those systems, this thesis concentrated on the Medical Logistics System, the system used by the Air Force to pass requisitions to DPSC.

Further, DLA's role in wartime normally has been what logisticians call "sustainability," meaning DLA was not involved until a month or two into a conflict. However, in 1986, as part of a DOD reorganization, DLA became responsible for providing additional consumable items, and, earlier this year, for controlling all of DOD supply depots. DLA's wartime role changed and they are now "in the loop" from the beginning (Shoop, 1990:36). The Office of the Secretary of Defense recently designated DLA as a "Combat Support Agency" (McCauley, 1991).

When Operation Desert Shield began, DLA emergency supply operations centers operated 24 hours daily. In the first month, DPSC handled 37,000 requests for medical supplies (Shoop, 1990:36). For stateside bases, the number of requisition backorders began to increase. Individuals at Hq DLA, DPSC, and many of the medical centers worked extended hours on priority projects related to what became Operation Desert Storm, and were not available to provide assistance when this research effort first began.

Although most of the systems included in this study were designed to function in wartime as in peacetime, it was anticipated that the most significant hurdle for this research would be the effects (i.e., increased backorders, processing times, etc.) of Desert Storm. However, while many of those interviewed felt there were problems, the systems performed as designed. As the research effort concluded, performance trends indicated the processes were returning to normal.

Structure of this Thesis

Defense Management Report Decision 901 resulted in the cost of medical supplies increasing by 9.8 percent. Inflation and implementation of other DMRDs most likely will cause additional increases. With the implementation of DMRD 971 and the establishment of a new revolving fund - the Defense Business Operations Fund (DBOF), which will encompass all current industrial and stock fund activities, cost will be a factor in decisions at all levels (Berle, 1991). Therefore, efficient management of the processes for which DLA is responsible is crucial to its viability.

Before a process can be managed, before action can be taken to improve it, it must be understood. The objective of this thesis was to document and define the process used to provide medical supplies to DLA customers. Chapter II, in the form of a literature review, contains a description of a generic order cycle process and its associated components. The description provides a frame of reference for the order cycle of medical supplies. The review also includes an overview of the Military Standard Logistics System and its standards which affect the requisitioning process. Most importantly, a discussion of ideas to improve order cycle performance and process control, which may be applied to the medical supplies process is included.

Chapter III presents the methodology used in gathering and analyzing the data to answer the research questions presented in this chapter. Chapter IV presents a detailed outline of the medical supplies pipeline and discusses the processes and organizations involved in requisitioning medical supplies from DLA. The chapter also provides answers to the first three investigative questions posed. Chapter V addresses how the medical supplies requisitioning process is being measured, and answers the remaining investigative questions. The conclusions and recommendations for future study of the medical supplies pipeline also are included in Chapter V.

II. Literature Review

Overview

The objective of this research effort was to document the flow of information in the medical supplies pipeline from the determination of requirement to receipt of the particular item by the customer. Since the process is similar to the order cycle of most companies, the literature review concentrated in the area of order processing and how it can be improved, especially in the medical supplies arena.

This chapter is divided into four major sections. The first section provides a definition for process. In section two the order cycle process and its associated components are discussed. The third section presents an overview of the Military Standard Logistics System (MILS), and more specifically the Military Standard Requisitioning and Issue Procedures (MILSTRIP) system and how it impacts the medical supplies pipeline. The fourth section documents leading practice toward the improvement of order cycle performance.

Definition of a Process

In a computer-oriented society such as today's, it is almost common knowledge that a process is something which changes inputs into desired outputs. A more technical definition states that a process is "a systematic sequence of operations designed to produce a specified result, or loosely, an ongoing activity" (Bohl, 1980:486). However, a definition more applicable to this study follows:

> A process is the transformation of inputs (manpower/services, equipment, materials/goods, methods, and environment) into outputs (manpower/services, equipment, materials/goods, and methods). The transformation involves the addition or creation of value in one of three aspects: time, place, or form. (Gitlow et al., 1989:38)

A process provides what is needed when it is needed, where it is needed, and how (in the form) it is needed. Therefore, process is important to understand because organizations are comprised of numerous processes, all having customers and suppliers (Gitlow et al., 1989:38). This is especially true in the medical supplies pipeline where there are numerous organizations responsible for their own segment of the process.

Unless a process is effective, customers will not be satisfied and suppliers will fail to achieve their goals. To insure that the supplier can measure how the process is operating, a feedback loop should be provided from each link (McLeod, 1983:79). These feedback loops then can be used to document that the process is "logical, complete, and efficient" (Gitlow et al., 1989:39).

Documenting a Process. There are several questions which must be answered to document a process. (1) The owner, an individual responsible for the condition and any changes to the system, must be identified. (2) The boundaries of the process must be established. Establishing boundaries makes it easier to identify key interfaces which are frequently the cause of process problems (Gitlow et al., 1989:42-43). (3) The flow of the process needs to be understood. Frequently this is accomplished by providing a picture (flowchart) of the process. A flowchart is used because it has the following advantages: it is concrete; it provides a visual picture; unnecessary details are removed; relationships are easier to understand; errors in logic are easier to spot; and it provides a record which can be easily understood or changed. For this particular study a systems flowchart, which is a "pictorial summary of the sequence of operations that make up the process," (Gitlow et al., 1989:43) was appropriate. (4) The objectives of the process must be identified. (5) It must be determined if the process is being measured in a valid manner (Gitlow et al., 1989:48).

Valid Measurement of the Process. According to C. William Emory, any tool used to measure should be "easy and efficient to use," and "an accurate counter or indicator of what we are interested in measuring" (1985:94). He further states that "validity, reliability, and practicality" are the important ideas which should be considered when determining the goodness of a measurement tool. Emory defines validity as "the ability of a research instrument to measure what it is purported to measure" (1985:94). Reliability is achieved when the measurement instrument produces "consistent results," and practicality when the instrument is easy to use and the results can be explained (Emory, 1985:94,101). Precise definitions of process objectives, specifications, products/services, and operational definitions used for collecting data help to insure valid measurements are taken (Gitlow et al., 1989:48). The process of interest in this study is the order cycle.

Order Cycle Process

The order cycle for medical supplies is the process which takes place between a customer and a supplier and results in value being added to the product. It is the "nerve center of the logistics system . . . the communications message that sets the logistics process in motion" (Stock and Lambert, 1987:499). The order cycle includes all of the elapsed time and activities that occur between the placement of an order until the product or service is received by the customer (Novack, 1989b:1). This time period may be also referred to as lead time, or the replenishment cycle. Figure 2 illustrates a generic order processing flow, which, as Chapter IV reveals is quite different from the one for medical supplies.

The length and reliability of the order cycle will have a significant impact on the level of customer service the supplier will be able to provide. From a supplier perspective, the length of the order cycle will determine

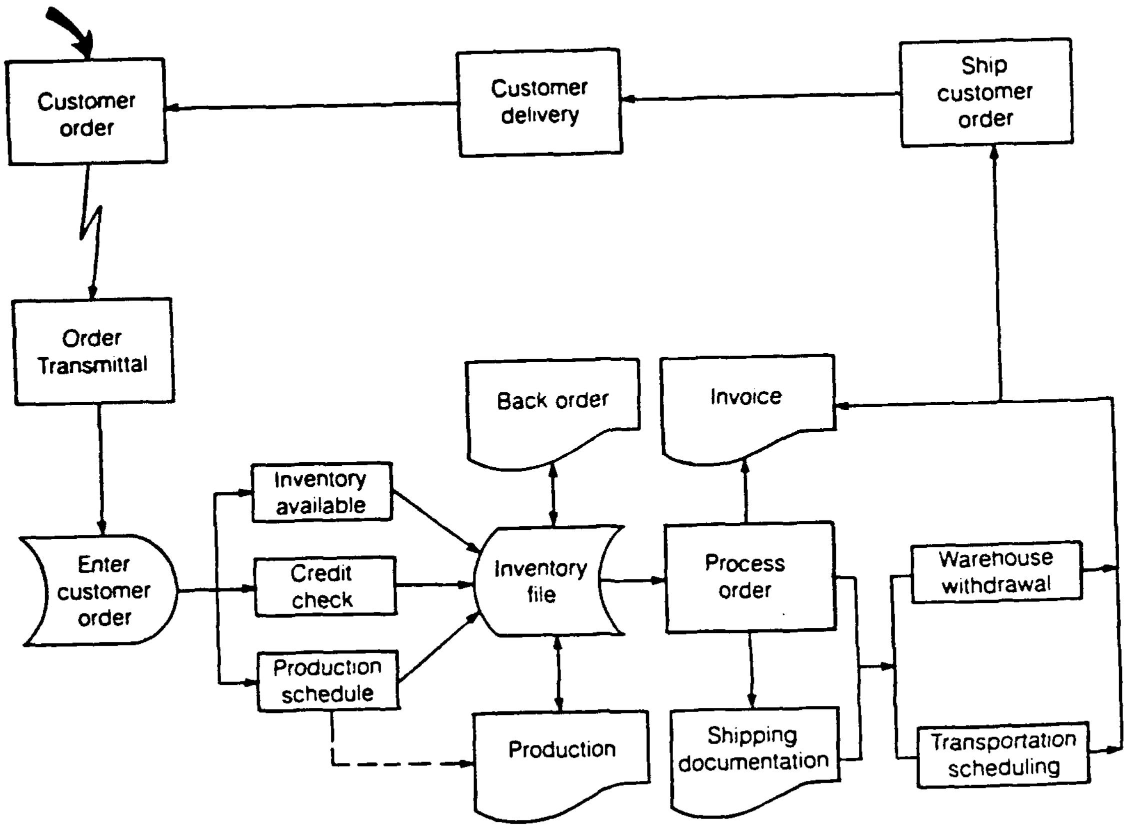
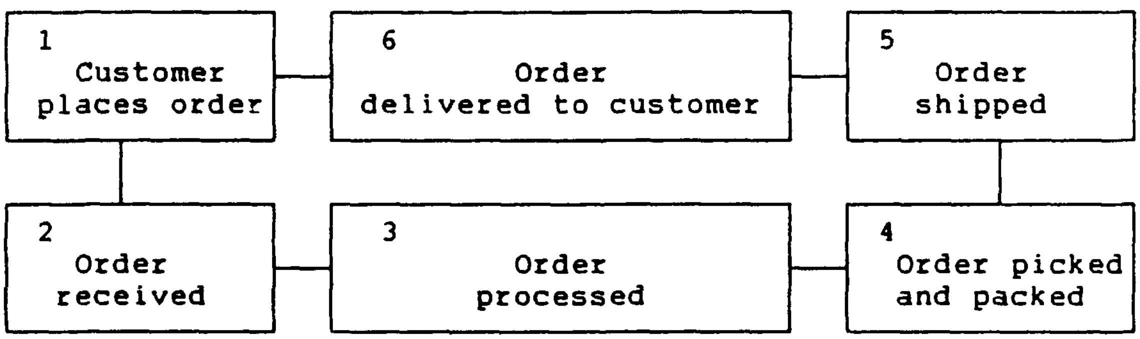


Figure 2. Generic Order Processing Flow
(Stock and Lambert, 1987:504)

the level of inventory he must keep to meet customer demand. The shorter the cycle, the higher the inventory level the supplier must maintain; for the customer the opposite is true. (Coyle et al., 1988:94). If backordering and expediting are necessary, the overall length of the order cycle will be affected.

Customer activities, such as returns, adjustments to bills, etc., are not considered part of the order cycle and, thus, do not affect its length. According to a study sponsored by the Council of Logistics Management, the average order cycle for manufacturing firms "was about 10 days," although it varies dramatically depending on the industry (Stock and Lambert, 1987:500).

Components of the order cycle and average timeframes, depicted in Figure 3, typically consist of the following: (1) order placement, (2) order receipt and entry, (3) order processing, (4) order preparation, (5) order shipment, and (6) customer receipt (Stock and Lambert, 1987:500).



KEY:

1	Order Preparation and Transmittal (Order mailed)	3 days
2	Order Received and Entered Into System	1 day
3	Order Processing	1 day
4	Warehouse Picking and Packing	1 day
5	Transit Time	3 days
6	Warehouse Receiving and Placing into Storage	1 day
	Total Order Cycle Time	10 days

Figure 3. Total Order Cycle: A Customer's Perspective (Stock and Lambert, 1987:500)

Order cycle placement and order receipt includes the time that elapses commencing with order placement by the customer and ending with order receipt by the supplier. Depending on the medium used for placing the order, lead time can be affected by a matter of minutes or days. Experience has shown that improvements in the order placement component result in the greatest possible reduction in order cycle length (Coyle et al., 1988:494).

The order processing component usually requires time to perform a customer credit check, transfer information to sales and inventory records, and prepare shipping documents. If electronic data processing equipment is being used, these functions may be accomplished simultaneously (Coyle et al., 1988:495).

During order preparation, the products are "picked" and packaged for shipment to the customer. Depending on the sophistication of the materials handling systems, this step also will add minutes or hours to the lead time. Although a highly automated system may be expensive, its benefits must be considered (Coyle et al., 1988:495).

Another component of the order cycle is order shipment; its time includes the interval when the order is placed in the delivery vehicle until it is received and unloaded at the customer's destination. As noted in Figure 2, the average transit time of the order cycle for most manufacturers is three days.

There are numerous functions and related systems which comprise the logistics pipeline for an item of supply in the DOD. Many of these systems are encountered on a daily basis in diverse functional areas, such as cataloging, inventory management, procurement, distribution, transportation, and contract administration; therefore, it is important to understand their purpose. Those which are most critical to the order process cycle for medical supplies are discussed in the following section.

Military Standard Logistics System (MILS)

MILS was developed to provide uniform operating procedures for all of the basic functional areas of the materiel life-cycle. Table 1 lists the elements which comprise MILS.

The communication and standardization provided by MILS enabled components of the DOD to automate many paper processes. The audit trails created by procedures of MILS make it possible to track materiel and supply communications as they pass through the defense logistics system (DA, 1986:3-1).

Military Standard Transaction and Movement Procedures (MILSTRIP). MILSTRIP is the DOD version of the order cycle process. It was designed to operate between the customer and supplier and to provide standard procedures for requisitioning (ordering) and issuing materiel. The DOD system uses uniform methods of communication between

TABLE 1

ELEMENTS OF MILITARY STANDARD LOGISTICS SYSTEM

Procedural Title	Acronym	DOD Pub. Number
Military Standard Requisitioning and Issue Procedures	MILSTRIP	4140.17-M
Military Standard Transaction Reporting and Accounting Procedures	MILSTRAP	4140.22-M
Military Standard Transportation and Movement Procedures	MILSTAMP	4500.32-R
Military Supply and Transportation Evaluation Procedures	MILSTEP	4000.23-M
Military Standard Billing System	MILSBILLS	4000.25-M
Military Standard Contract Administration Procedures	MILSCAP	4105.63-M
DOD Activity Address Directory	DODAAD	4000.25-D
Military Assistance Program Address Directory	MAPAD	5105.38-D
Uniform Materiel Movement and Issue Priority System	UMMIPS	4410.6

(DA, 1986:3-2)

customers and suppliers. MILSTRIP achieves its objectives through the use of standardized forms, standardized coding (provided in the appendices of each military service's basic regulation), standardized formatting, and the UMMIPS time standards and policies.

Key MILSTRIP policies are as follows:

(1) The frequency of requisition submission is the prerogative of the requestor/requisitioner.

(2) To satisfy the customer's materiel demand on time without operating and transportation costs becoming an overriding factor.

(3) Each supply echelon will make maximum use of local resources prior to placement of a demand (requirement) on a higher level source of supply.

(4) High-priority requisitions will be held to an absolute minimum consistent with the urgency of the requirement.

(5) Automatic digital network (AUTODIN) via the Defense Automatic Addressing System (DAAS) will be used to the maximum extent possible for data transmission of all MILSTRIP communication. The only exception will be requisitions with exception data, i.e., manually created annotations to an original request.

(6) A supply activity will not change a required delivery date/required availability date assigned by the requestor/requisitioner.

(7) Maximum use will be made of electronic accounting machines, automatic data processing equipment, and high-speed data transmission equipment. (DA, 1986:3-6)

Customers forward their requests for medical supplies through AUTODIN to Defense Personnel Support Center at Philadelphia, PA. The Center, using the Standard Automated Materiel Management System, checks the inventory of the depots holding the particular item, and issues a materiel release order (MRO) to the supply depot serving the geographical area of the customer/requisitioner. The depot then uses the DLA Warehousing and Shipping Procedures System to prepare the shipping documents and identify the location of the item in the warehouse. After the materiel is selected by "stock pickers," it is packaged and consolidated with any other items going to the same destination (DLA, 1990a:111).

The depot's computer automatically figures the size and weight of packaged items. It passes this information, along with the number of items for each destination and their priority, to the transportation officer. The transportation officer then determines the type of transportation required, and ensures the carrier will be waiting at the dock when the item is ready for shipment. According to Defense Logistics Agency, supply items with a high requisition priority generally leave the depot a "few hours after the requisition is received," and "items are shipped according to their priority by the fastest, most economical form of transportation" (DLA, 1990a:111).

Uniform Materiel Movement and Issue Priority System (UMMIPS). UMMIPS is not a distinct element of MILS, but is the DOD "Rule Book" which establishes time standards for requisitioning and movement of defense materiel (DA, 1986:3-2). The objective of UMMIPS, which operates in both war and peacetime, is to provide maximum requisition and movement time standards so that customers will know when their demands will be met. Suppliers use the time standards to judge how rapid their response must be. The standard times provided by UMMIPS insure that materiel requirements are processed based on the mission of an organization and the urgency of need for the product. The codes assigned to the mission and urgency of need are combined into a priority designator. UMMIPS time standards for each segment of the order cycle are based on these priority designators (DA, 1986:3-5). Table 2 presents the UMMIPS time standards which govern DOD logistics functions, including medical supplies.

TABLE 2

UMMIPS TIME STANDARDS

Time Segment	Time Standard (in calendar days) For Priority Designators 01-03	04-08	09-15
Requisition submission	1	1	2
Passing Action	1	1	2
Inventory Control Point availability determination	1	1	3
Depot/Storage Site Processing	1	2	8
Transportation Hold and CONUS Intransit to CONUS Requisitioner, Canada, or to POE	3	6	13
Overseas Shipment/Delivery: To Alaska, Hawaii, South America, Caribbean, or North Atlantic	4	4	38
To Northern Europe, Africa, or Mediterranean	4	4	43
To Western Pacific	5	5	53
Receipt Take up by requisitioner	1	1	3

(DOD, 1980:3)

Improving the Order Cycle Process

"A customer order serves as the communications message that sets the logistics process in motion" (Novack, 1989b:10). The timeliness and quality of information concerning an order can have a direct impact on all other logistics functions. Assuming that a satisfied customer is one of the goals of most firms, a firm must supply quality in product and service to the market (Novack, 1989b:10). Much of the current literature contends that electronic data interchange (EDI) serves as the "magic wand" for order cycle improvement (Robins, 1988:53).

Electronic Data Interchange.

> Electronic Data Interchange (EDI) is the corporate to corporate exchange of business information electronically between business parties and (possibly intermediaries) in a structured format. Because of the structured format, electronic documents can quickly be transmitted from one computer system to another without manually rekeying the information. (Ferguson, 1989:419)

For several years, authors have contended that increased customer service, improved information flows and reductions in inventory are some of the direct benefits of online documentation order processing (Jagodzinski and Moffatt, 1985:32). However, the latest literature touts EDI as the way to improve the entire order cycle. Some feel EDI provides a competitive advantage; others feel it is a competitive necessity (Skagen, 1989:30). Regardless of how the DOD approaches EDI, the Inventory Reduction Plan "10-

Point Program" states that timely implementation of EDI technology enhancements will be pursued (Mitchell, 1990:27).

Benefits of Use. According to one advocate, EDI gives one instead of four weeks turnaround on orders (Robins, 1988:53). It appears that all points of the order cycle, where communication is made with either customer or vendor, will be made faster and more accurate. The effect is not just to eliminate paper, but also to eliminate errors. With EDI, supplies can be ordered automatically, purchase orders prepared and transmitted, and inventories updated. By using EDI, a company can have total pipeline visibility, from vendor to customer (Robins, 1988:53).

Similarly, Skagen believes the computer-to-computer exchange of data can skim four days from the order cycle. The results are a "faster response to market needs and a twenty-five percent reduction in finished goods inventory" (Skagen, 1989:28). While some feel that EDI may be beneficial, others feel it is a necessity for firms who require Just-in-Time (JIT) delivery. Skagen feels that EDI "isn't just bringing individuals and companies together; it's bringing countries together" (Skagen, 1989:30).

EDI may be considered "the enabler that makes major improvements to everyday business practices and procedures possible" (Hough, 1989:1). Hough feels that long processing times affect the quality of products produced by American businessmen. If one looks closely, they will discover that most of these time-phased activities contain periods of "float," which he defines as "periods of activity or inactivity that do not contribute directly to the actual production and delivery of components and parts" (Hough, 1989:2). There is "float" in data entry, order processing, shipping and receiving, with the predominant source of "float" being associated with data. And as this data changes hands and form, error is introduced. According to Hough, more than half of the time associated with a time-phased activity is "float," and the majority of it is "intercompany" (Hough, 1989:3).

Use of EDI enables companies to greatly reduce "float." By communicating computer-to-computer, companies can become "paperless" and "timeless," with the greater opportunity being "in the integration of customers and suppliers" (Hough, 1989:4). It does not seem possible to satisfy the customer without using EDI, and most of the competition is already using it. Hough's view is that managers must quickly learn more about EDI. Customers are requesting it, and numerous companies--maybe the competition--are using it daily (Hough, 1989:5).

Based on the number of articles one finds in any periodical listing, Journal of Business Logistics, Transportation Journal, Information Strategy: The Executive's Journal, Journal of American Medical Association, the philosophy of JIT has been accepted.

However, with the critical timing of JIT, systems which require more than a few minutes to process an order will no longer be acceptable. Processing will have to be on-line, and EDI provides the necessary linkage (Bookbinder and Dilts, 1989:57).

Order communication, order processing, and transportation components of the order cycle affect inventory management. Although a company's performance may be affected by both the average length and variance of the cycle, research has indicated that the uncertainty in the order cycle has the most significant influence on inventory performance (Closs, 1989:101). However, EDI has the potential to reduce the average time and improve the consistency of the order cycle. Through computer-to-computer ordering, requirements can be identified almost instantaneously, and replenishment can be on the way in a number of hours. (Closs, 1989:101).

Speed and reduction in lead time were the most common answers to a recent survey addressing the benefits of EDI (Ferguson, 1989:432). The benefits listed as second and third were satisfying the customer's request and cost efficiency. Increased accuracy was the next most popular response (Ferguson, 1989:432). Other benefits which have been identified include reduction in paperwork, better inventory control, and improved relationships between customer and suppliers (Zinn, 1990:28).

Evidence for Growth. Bar code ticketing and laser scanning will make it even easier for firms to move to EDI. The more a firm automates, the easier it will be to employ EDI. In the near future, instead of transmitting purchase orders electronically, retailers may be transmitting their sales data on a regular basis to the supplier. The supplier then may use the data to determine what to ship to the customer. As a result, firms will be able to automatically satisfy their customers (Robins, 1988:58).

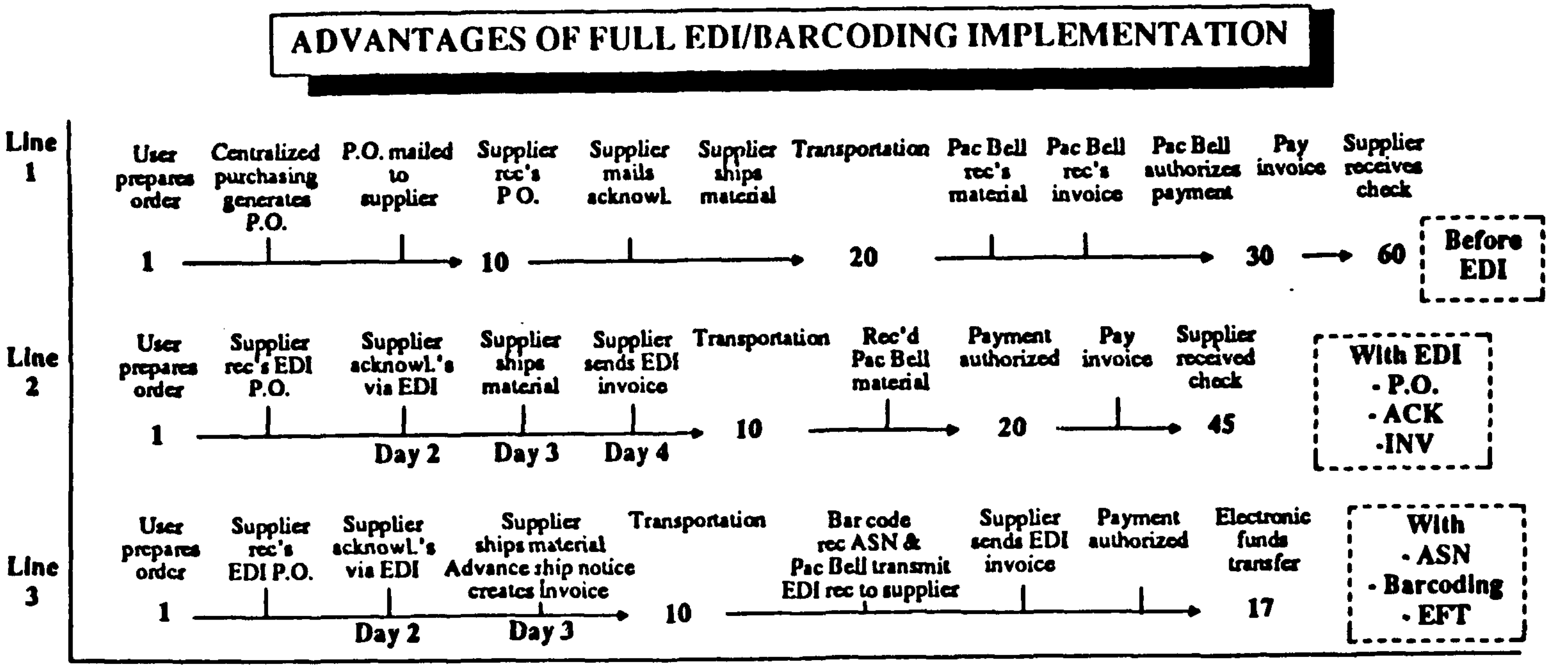
According to a recent study, one-half of the U.S. companies surveyed now receive purchase orders from customers through EDI. In ten years, the prediction is that all major companies will be using EDI in some way (Couch, 1988:7). Other studies provide evidence for future growth of EDI. "Almost three-fourths of the firms currently doing or planning EDI expect their usage to increase significantly in the future" (Ferguson, 1989:432).

Although it certainly appears EDI is the wave of the future, some feel that earlier predictions have not held. It was noted that the number of present day users is a far cry from the claim that by 1993, seventy percent of all business would be making significant use of EDI (Skagen, 1989:28).

Bar Coding. In the early 1970's, the retail food industry began using the universal product code (UPC) to identify goods at the point-of-sale. Originally there were problems associated with marking products with the UPC, but as technology advanced and portable computer terminals became a reality, the bar code system was adopted quickly (Bagley, 1990:14). With the advent of the wand-type scanner, stock taking no longer required keying product codes. As additional industries realized the advantages of the bar code system, engineers were pressed to improve the technology. Employing the latest technology, the bar code laser scanner is fashioned like a gun and emits laser light as the source for creating optical input (Bagley, 1990:14-16).

Bar coding and laser scanners are used to track warehouse inventories and numerous manufacturing operations. And as products move from the warehouse to the shipping dock, a final scan can ensure the product is proceeding to the correct destination. In addition, bar coding is becoming a key component of EDI systems by allowing the computer to place orders directly with suppliers and receive confirmations and shipping data automatically (Bagley, 1990:15).

By using EDI purchase ordering, barcoded receipting, and electronic funds transfer, one company found it possible to reduce the entire procurement timeline by 75 percent. Figure 4 portrays the experience of Pacific Bell. Line 1 shows the number of days a transaction took to process prior to their implementation of EDI. Line 2 shows the change in



.Figure 4. One Company's Experience with EDI/Barcoding number of days when the purchase order, purchase order acknowledgement, and invoice were processed through EDI. Line 3 illustrates the change in days when advance ship notice, coupled with barcode receipting, and electronic funds transfer were added to the process (Barcodes and EDI, 1990:41-43).

Prime Vendor Concept. The performance of materiel managers centers on four basic goals: (1) having materiel available when needed, (2) paying the lowest possible price for the purchased materiel, (3) minimizing inventory investment, and (4) operating efficiently (Young, 1989:27). The prime vendor concept is a tool managers may use to attain those goals.

Prime vendor contracts make it possible for members of a buying group to use the vendor as the sole source for the majority of the items they need. The vendor is required to offer a full line of products from different manufacturers.

A study of the hospital industry revealed that hospitals using the prime vendor concept had more inventory turns, a better fill rate, and fewer purchase orders on a daily basis (Young, 1989:29).

Just-in-Time Distribution. Placing an order is just the first entry in the long list of expenses related to handling supplies. "For every dollar spent to buy a product, hospitals spend another moving the product through the system" (Freudenheim, 1991:5). To defray those costs some hospitals have sold their warehouses and inventories and moved to a stockless system. Under the stockless system, suppliers deliver "just-in-time" to hospital loading docks or directly to the department or operating room. By moving to computerized ordering, just-in-time deliveries and stockless service, hospitals report large annual savings because of reduced staff and inventories (Freudenheim, 1991:5).

Process Control. The order cycle is common to most firms. The goal of the order fulfillment process is to ensure the customer gets the right product at the right time, in the right quantity. Thus, the successful creation of time, place, and quantity utilities can add to the quality of the firm's output (Novack, 1989a:24).

To ensure quality exists, however, it must first be defined. Quality is customer-oriented, and it can be defined as those characteristics important to the customer and agreed to by the supplier (Novack, 1989a:24). Once quality has been defined, it can be measured. This means establishing standards which agree with the customer's definition of quality and measuring process performance against those standards. Once quality can be measured, it can be controlled to insure that the product/service continues to meet the customer's definition of quality (Novack, 1989a:24).

To control the order cycle, each of the components of the process must be effective, i.e., meet standards. To determine if the components are effective (i.e., are contributing to the quality of the product or service), a separate examination should be conducted for each (Coyle et al., 1988:499).

One approach is a statistical analysis to determine (1) what is really happening in the process, (2) the process capability, and (3) to identify and verify component variances (AFLC, 1989). To analyze a component of the order cycle, such as delivery time, it is necessary to know not only the mean, or average, time elapsed from the issuance of the purchase order to the receipt of the order, but also the "likely variation of delivery times from the mean" (Coyle et al., 1988:513).

Figure 5 illustrates how order cycle component variances typically are reported. The time distribution of each component represents the average and range of processing times an order can experience as it passes through the order cycle.

Statistical Process Control (SPC). "The underlying philosophy of SPC is that to control any process you must first understand its underlying natural, or inherent, variability" (Coyle et al., 1988:513). SPC is a concept which applies statistical methods to monitor process

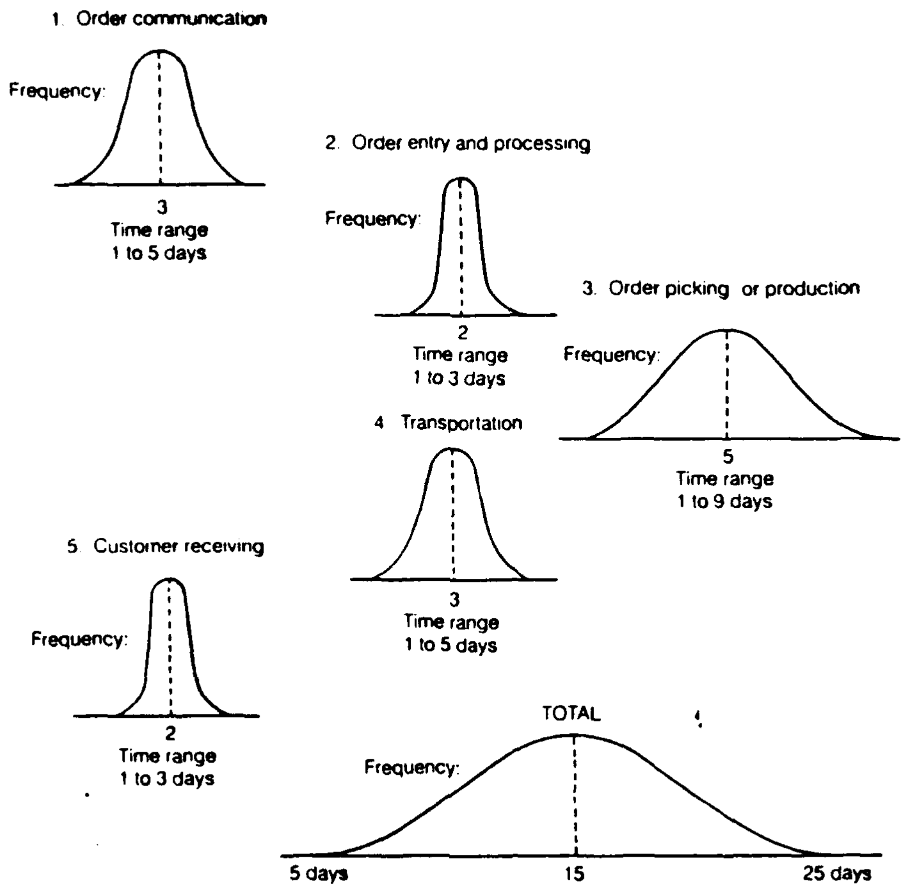


Figure 5. Order Cycle Distributions (Stock and Lambert, 1987:502)

variation over time (AFLC, 1989). According to W. Edwards Deming, "every process has variation," however, "the more finely tuned the process, the less deviation there is from the average" (Walton, 1988:114).

Figure 6 presents three steps which must be followed and three questions which must be asked to apply statistical process control.

First a system is designed. Then, standards are established. Third, the system performs its process. Once the system is performing, it should be determined if the

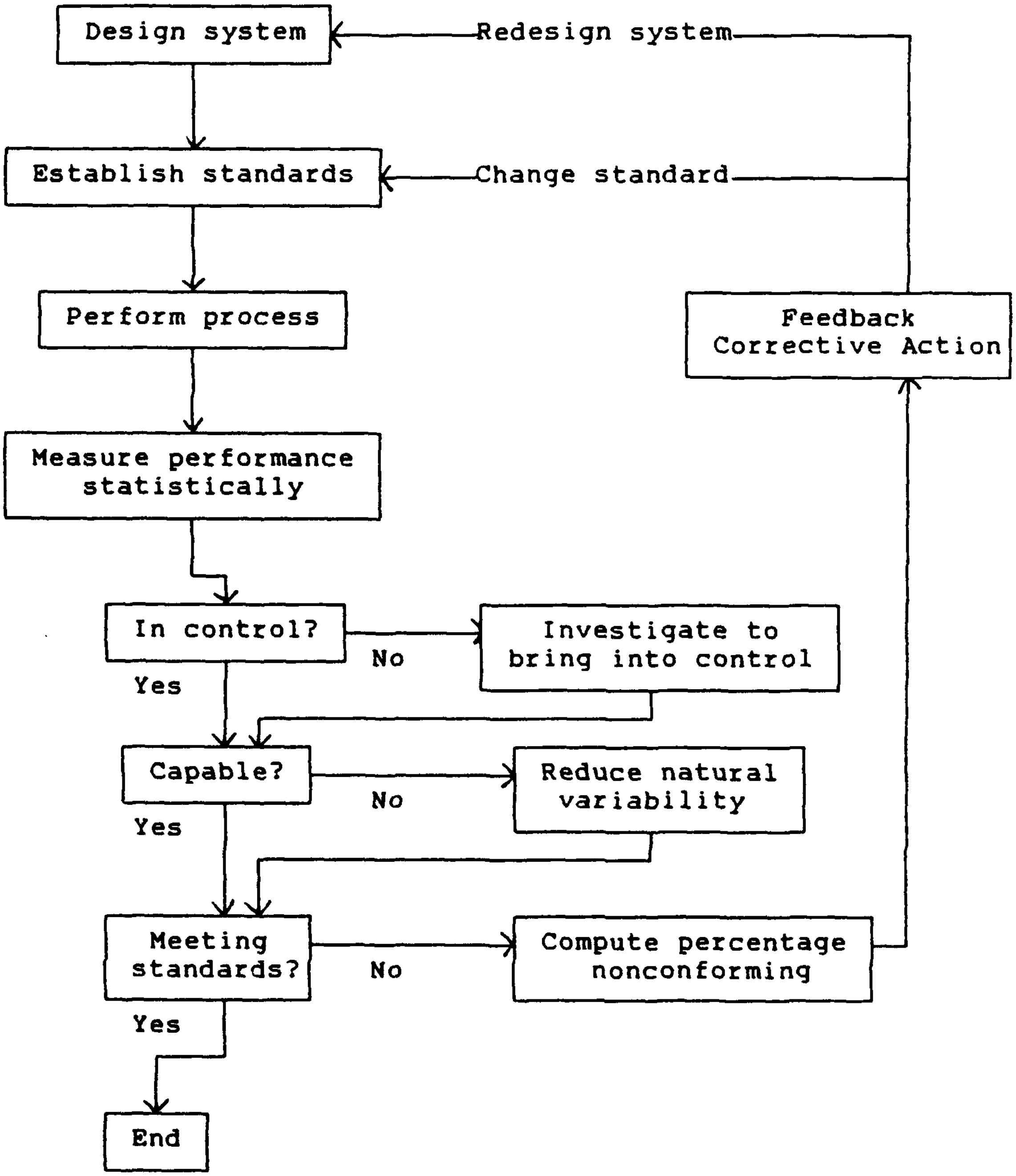


Figure 6. Statistical Process Control
(Coyle et al., 1988:514)

measurements are in control. That is, do they fall within a reasonable range of the mean? The second question is to determine if the process is capable--"in that its observed variability is measured to be less in magnitude than a prespecified range" (Coyle et al., 1988:513). Lastly, it is determined if the standards and measurements agree. If the answer to all three questions is yes, the process is in control (Coyle et al., 1988:513-514).

Sophistication of Control. Novack described a method to determine a firm's overall level of sophistication of control applied to the order cycle and its components. According to this method, there are nine characteristics of control:

Degree of Data Aggregation
Reporting Mechanism
Degree of Sophistication in Setting Standards
Timing of Data Aggregation
Variance Cause Identification
Degree of Measurement Over Time
Degree of Corrective Action
Level of Managerial Involvement
Type of Corrective Action
(Novack, 1989a:35-36)

Each of the nine characteristics of control has three levels of sophistication (See Table 3). For each characteristic, the level of sophistication which best represents how control is being exercised over the order cycle and its components is indicated by 1, 2, or 3. A response of zero may be indicated if that characteristic is not represented in the control system. The responses over

TABLE 3

LEVELS OF SOPHISTICATION OF CONTROL

	Level I	Level II	Level III
Degree of Data Aggregation	Data collected on an aggregate basis only, e.g., total order cycle time for the system	Data collected on individual system components, e.g., shipment time for system	Data collected on individual system components by major market or customer
Reporting Mechanism	Actual vs. standard data presented using performance measures only	Actual vs. standard data presented using performance measures with standards having allowable tolerances	Actual vs. standard data presented with statistically derived tolerances in control chart format
Degree of Sophistication in Setting Standards	Standards are based on historical data only	Standards plus tolerances are developed from engineering studies	Standards and tolerances are statistically derived and are based on what the activity can do and what management would like to do
Timing of Data Aggregation	Data collected and reported on a yearly basis only	Data collected and reported on a monthly basis	Data is collected and reported immediately
Variance Cause Identification	Variances from standards are not noted or investigated as to their cause(s)	Variances from standards are noted but no action is undertaken to determine if the cause(s) is common or assignable	Variances from standards are noted and investigated to see if they are common or assignable

TABLE 3 (Cont)

LEVELS OF SOPHISTICATION OF CONTROL

Level I	Level II	Level III
Degree of Measurement Over Time		
Actual vs. standard data recorded but not accumulated over time for tend	Actual vs. standard data accumulated over time but trend analysis not performed	Individual variances are noted and plotted over time for trend analysis
Degree of Corrective Action		
No corrective action plans have been developed because cause and effect relationships have not been identified	Corrective action plans are developed for only certain errors because of a limited identification of cause and effect relationships	Corrective action plans are developed for all types of errors because all cause and effect relationships have been identified
Level of Managerial Involvement		
Only manager level or above reviews variances and recommends action where necessary	Supervisor level or above reviews variances and recommends actions where necessary	Person performing the process reviews the variance, investigates errors, and takes action
Type of Corrective Action		
Corrective action basically includes only the changing of standards when errors occur	Corrective action basically includes either the changing of the standards or the changing of the process itself when errors occur, regardless of the cause of the error	Corrective action basically includes the changing of standards and/or the changing of the process itself, depending on the cause of the error

(Novack, 1989a:35)

the nine characteristics are averaged to determine the overall level of sophistication of control being applied to the order cycle.

Summary

The order cycle for medical supplies is composed of several components which must cooperate if the customer is to receive his order. The length and reliability of the medical supplies order process has a significant impact on the level of customer service DLA is able to provide its customers. The literature demonstrated that improvements in the method of order placement result in the greatest possible reduction in order cycle length.

Electronic data interchange (EDI) and barcoding are working like magic to reduce order cycle time, improve accuracy, and reduce paperwork for many companies. Using them together with electronic funds transfer enabled one company to reduce its entire procurement timeline by 75 percent.

If the medical supplies pipeline is to deliver a quality product to the customer, several steps must be followed. The definition of quality must be agreed to by both customer and DLA. Then, the process must be controlled to ensure the customer continues to receive the quality product. Measurements essential to process control, and, as the literature review revealed, numerous methods for measuring, such as statistical process control, are available.

A generic process is composed of three basic components: input, process and output. For the medical supplies customer their requisition is the input, the communication that sets the process in action. Chapter III presents the methodology used to discover and document how that information is "processed" into an output for the medical supplies customer.

III. Methodology

Overview

The current economic, political, and operating environment make it imperative that the Defense Logistics Agency (DLA) ensure the processes for which it is responsible operate efficiently and effectively. Before a process can be managed, and action taken to improve it, it must be understood. The Defense Personnel Support Center (DPSC) of DLA is the inventory control point for approximately 66,000 medical supply items, and is responsible for providing those supplies to Department of Defense (DOD) customers worldwide. The objective of this study was to define and document the process used by customers to order those medical supplies from DPSC.

The research method followed for this study encompassed three major phases. The first phase included a detailed literature review concerning the areas of process definition, order cycle process, systems affecting the military order cycle process, and methods of improving the order cycle process. The second phase involved the development of a model depicting the information flow of the medical supplies pipeline. Copies of the flowcharts and narratives explaining the charts were mailed, handcarried, and telefaxed to the appropriate organizations involved in the process so that the model could be verified. Comments and suggestions from the respondents were incorporated into the final product. In the third phase, the data gathered during the study were analyzed to determine how the order cycle for medical supplies is being managed.

According to Schendel and Cool (1988:28), research in any particular field should advance through a developmental process as the discipline matures (See Figure 7). Initially, research in a field begins in the prescriptive cell and frequently consists "of untested, or worse, untestable statements" (Schendel and Cool, 1988:28). Research in the descriptive phase uses personal insight, judgment and creativity in attempting to define the research problem. The results of this phase frequently serve as hypotheses which require further testing (Schendel and Cool, 1988:28). Finally, hypothesis testing completes the cycle, and it is here where the most careful, the best research falls. Using statistical methods, this type of research "can guide practice and explain results achieved" (Schendel and Cool, 1988:28-29).

A review of the literature relating to order cycle processing revealed that most of the previous research on the subject falls in the prescriptive and descriptive cells of the model. While prescriptive statements concerning an order cycle system are necessary for execution, they usually do not address matters of cause and effect (Schendel and

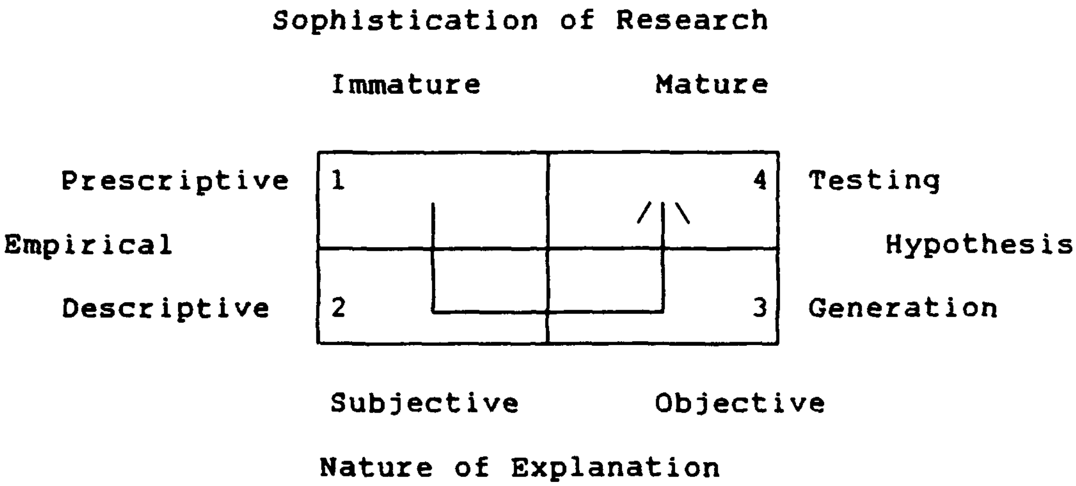


Figure 7. Depiction of Desirable Research Characteristics (Modified from Schendel and Cool, 1988:28)

Cool, 1988:28); therefore, they are of minimal assistance in process analysis or improvement.

To assist in progressing to the phase where future research will have the most impact on the requisitioning of medical supplies, this study presents a detailed description of the process.

Background

A Medical Process Action Team (PAT) was established at Hq Defense Logistics Agency (DLA) to review medical supply support. The PAT was chartered to perform the following tasks:

1. Review current medical support processes and flow chart them.

2. Identify who the medical customers are.

3. Poll and analyze customers' views to identify better practices and prioritize/differentiate what the customers' service and product needs are.

4. Recommend process improvements to enhance customer satisfaction.

5. Evaluate the decision making process on what gets stocked and what is direct-vendor delivered.

6. Provide a method of gathering and analyzing performance through customer feedback and acting on that information to ensure DLA meets customer requirements. (DLA, 1991)

The results of this DLA-sponsored research effort should assist the PAT in responding to taskings 1 and 4, specifically.

Since the objective was to document the requisitioning process for medical supplies, a "descriptive study . . . to learn the who, what, when, where and how of a topic" (Emory, 1985:69) was conducted. In describing the requisitioning process, the interest was in the relationship of the various components of the order cycle; thus, this effort can further be identified as a case study (Emory, 1985:61). A previous thesis studying the aircraft loading equipment spare parts pipeline employed the same approach (Gordon, 1989).

Before attempting to answer any of the investigative questions, exploratory research was conducted to gain a better understanding of the various processes and systems which are used for requisitioning medical supplies. A detailed literature review provided an examination of the key areas of process, order cycle, and the Department of Defense (DOD) requisitioning system. Included in the review was literature which addressed methods for improving the order cycle. Most of the literature reviewed either prescribed how a system should be designed or described how a currently established system operates.

Questions identified by Gitlow et al., (1989:42) to ask when documenting a process were adapted to the medical supplies pipeline. The specific methodologies used for answering the investigative questions posed in Chapter I follow:

<u>Research Technique for Investigative Questions One, Two, and Three</u>

The investigative questions posed in Chapter 1 included:

1. What offices, and organizations are involved in the medical supplies pipeline?

2. What is the flow of the process and what are the boundaries?

3. What are the procedures followed in the requisitioning of medical supplies?

A review of the regulations governing the requisitioning of medical supplies and the systems used in the process and personal interviews conducted with those involved in the processes provided answers for the questions listed above.

Interviews were conducted at the Wright-Patterson Air Force Base (WPAFB) Medical Center in Ohio, the Defense Personnel Support Center (DPSC) in Philadelphia, and the Defense Distribution Center in Mechanicsburg, Pennsylvania. Technicians, analysts, and supervisors at those locations provided details which were used to fully develop the flow of a requisition through the medical supplies order cycle.

The Medical Center at WPAFB was selected because of its proximity and not because it is, necessarily, representative of an Air Force medical center. Individuals at DPSC were interviewed because, as the DLA inventory control point for medical items, they are responsible for providing medical supply support to all military services and various civilian federal agencies within the continental United States. Technicians and supervisors at Mechanicsburg were interviewed because it is the site of one of the storage depots for medical supplies.

Personal interview was selected as the primary method of information collection because this survey technique offers more latitude for conducting descriptive research (Emory, 1985:160). Use of this technique provided the in-depth and detailed information which was necessary for flowcharting the process.

Once the data were collected, flowcharts of the major organizational components were developed to illustrate the processes, procedures, and interfaces involved in the medical supplies pipeline.

Figure 8 presents the symbology used for the flowcharts. The rectangular box represents an action in the process. A diamond denotes a decision point in the process, and the oval boxes represent components of the medical supplies pipeline. The off page connector box is used to follow the flow of the process from page to page. The document, file, and input/output boxes are used to represent system products, and the keyboard input box represents a manual input. The broken line denotes a communication link, and the solid line with an arrowhead shows the direction of the flow in the process.

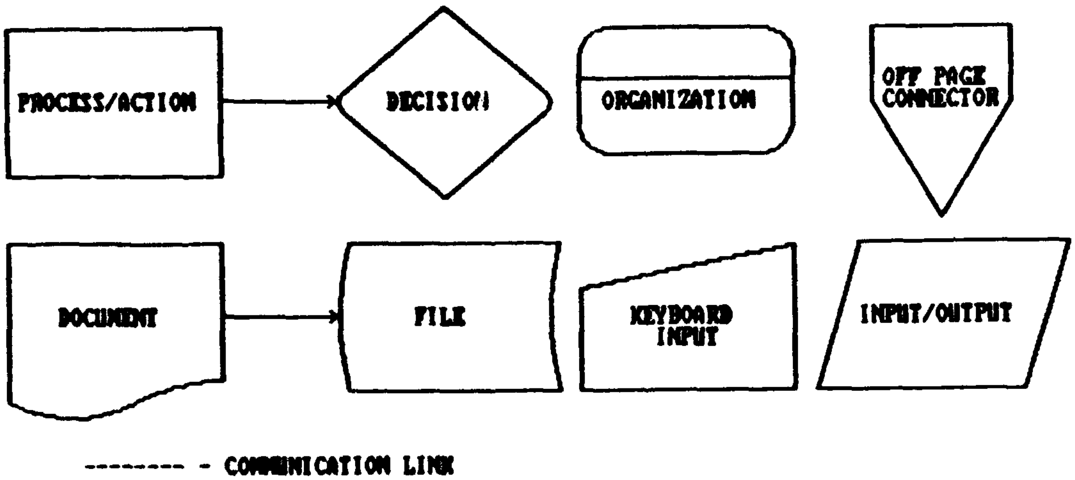


Figure 8. Flowcharting Symbology

Flowcharts were used because they have the following advantages: they are concrete, they provide a visual picture, unnecessary details are removed, relationships are easier to understand, errors in logic are easier to spot, and they provide a record which can be easily understood or changed (Gitlow et al., 1989:43).

The flowcharts and narrative description of the processes then were verified. After each component of the process was constructed, it was reviewed by the expert technicians and supervisors who had provided the information to ensure the flows and procedures were represented accurately. Flowcharts and narrative descriptions were handcarried, mailed or telefaxed to Medical Logistics, DPSC, and the storage depot at Mechanicsburg. There they were reviewed by those individuals who originally provided the information. Their comments/suggestions were incorporated in the final product.

Research Technique for Investigative Questions Four and Five

The fourth and fifth investigative questions asked:

4. What are the objectives of the process and how are they measured?

5. Are there performance standards, and how does current performance compare to those standards?

The members of the customer service Quality Management Board (QMB) at DLA cited the purpose of the medical logistics system as providing "the right material, at the right place, at the right time, at the right cost" (Brennan, 1990), and the Air Force Medical Logistics Office reminds its medical logistics officers their primary objective is "to provide outstanding logistic support for the missions assigned Air Force medical treatment facilities" (Peedin, 1989:2). Defense Logistics Agency and Air Force regulations were reviewed to determine how the process is being measured to ensure the medical logistics system meets its objective.

Numerous regulations, management reports, and documents were examined and questions were asked during the interviews mentioned earlier in this chapter to determine if there were performance standards and how offices/individuals are meeting those goals.

Summary

DLA recognized the need to understand the processes for which they are responsible for managing, especially the medical supplies pipeline. To understand the medical supplies pipeline, DLA needed to know the who, what, when, and where of the information flow in the process; therefore, a descriptive case study was undertaken. Managers, supervisors, and technicians involved in the process were interviewed, and a model of the system was developed and validated.

Chapter IV presents the model which documents the flow of a requisition for medical supplies.

IV. Process Description

General Overview

This chapter is the first step in documenting the process used by Air Force activities to requisition medical supplies from the Defense Logistics Agency (DLA), or more specifically, the inventory control point for most medical supplies, the Defense Personnel Support Center (DPSC). The chapter begins with a general diagram of the organizations/components that compose the medical supplies pipeline. Following the general pipeline diagram are flowcharts and process descriptions of those components which are relevant to DLA. These charts and descriptions detail the different routes a requisition takes to meet the needs of the medical supplies customer. In describing the flow, this chapter also addresses the first three investigative questions posed in Chapter 1:

--What offices and organizations are involved in the medical supplies pipeline?

--What is the flow of the process and what are the boundaries?

--What are the procedures followed in the requisitioning of medical supplies?

This analysis primarily concentrates on the flow of information required to requisition medical supplies of a routine nature. Although the component processing descriptions do briefly discuss priority and emergency requisitioning, they are not included in the flowcharts.

Pipeline Overview

The Air Force pipeline for medical supplies consists of six major organizational components: the customer, Medical Logistics, Base Contracting, the Defense Personnel Supply Center (DPSC), storage depot, and vendors. These components are connected by various communications media. Figure 9 illustrates the general flow of requisitions/orders for medical supplies through the components--the pipeline.

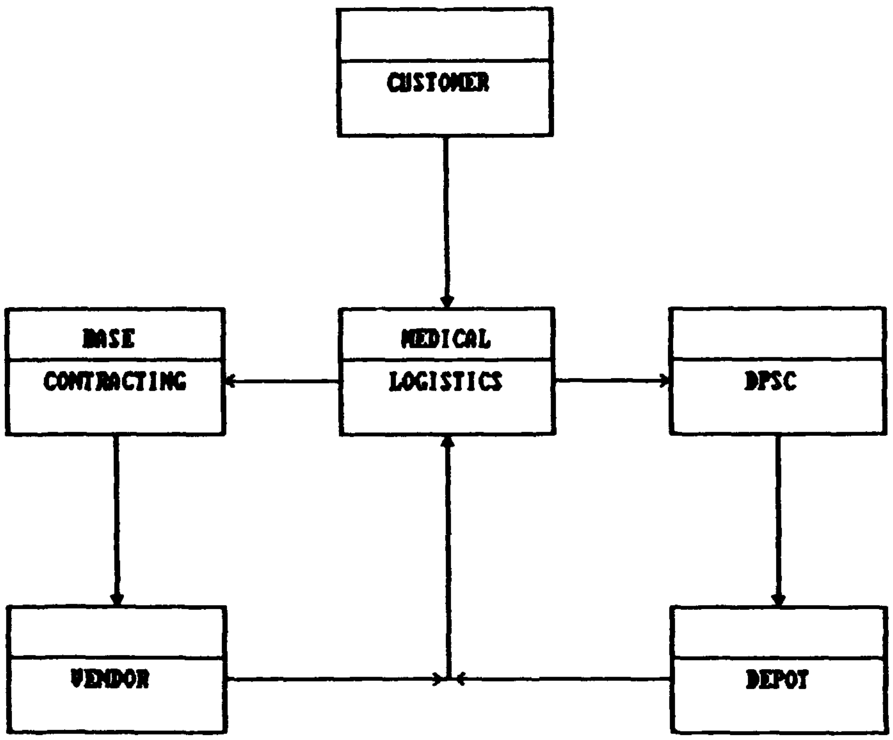


Figure 9. Medical Supplies Requisition - General Flow

As shown, requisitions originate with the customer and are passed to Medical Logistics. Medical Logistics either satisfies the requirement from on-hand stock or passes the requisition to the source of supply, usually DPSC. DPSC either sends the requisitioned item or transmits requisition status back to Medical Logistics, which, in turn, passes the item and/or status on to the customer.

If the request is for an item which is not stocked, there are several methods used for local purchase. In some cases, Medical Logistics is authorized to place orders directly with the supplying vendor. In cases where they are not, Medical Logistics at bases within the continental United States (CONUS) forwards the request to Base Contracting. For bases outside CONUS (OCONUS), DPSC provides contracting services for the majority of items obtained by local purchase.

Using this general outline as a reference, the next four sections of the chapter describe the flows and processes of the four major components (customer, Medical Logistics, DPSC, and depot) involved in the requisitioning of medical supplies. A general depiction of the communication flow among the components is presented also. To best understand the process description of the components, it is suggested the reader follow the flow diagram of the referenced figure.

Customer Processing

For the Air Force, a medical supplies customer could be an activity within the medical facility, a laboratory on base, a Guard or Reserve unit supported by that base, or any activity with a valid requirement for medical supplies. Each customer/activity has an individual designated to control the ordering and receiving of medical supplies. The processes the customer uses to order/requisition medical supplies are flowcharted in Figure 10 and follow the logic outlined in the following paragraphs.

Ordering procedures vary slightly depending on the size and location (CONUS versus OCONUS) of the medical facility. If there is a central processing and distribution (CPD) activity within a medical facility, the CPD serves as the supplier for common items. The CPD "pushes" materiel to customers on a specified time schedule or a delivered-as-required bases (USAF, 1989). In this instance, CPD is the customer of Medical Logistics. Otherwise, the customer "pulls" materiel through Medical Logistics.

There are basically three methods used by Medical Logistics' customers to "pull" supplies through the system. The preferred and easiest method is for the customer (supply custodian so named in the Air Force) to use the Using Activity Shopping Guide and place an order at the specified ordering time. The Shopping Guide is a customer unique

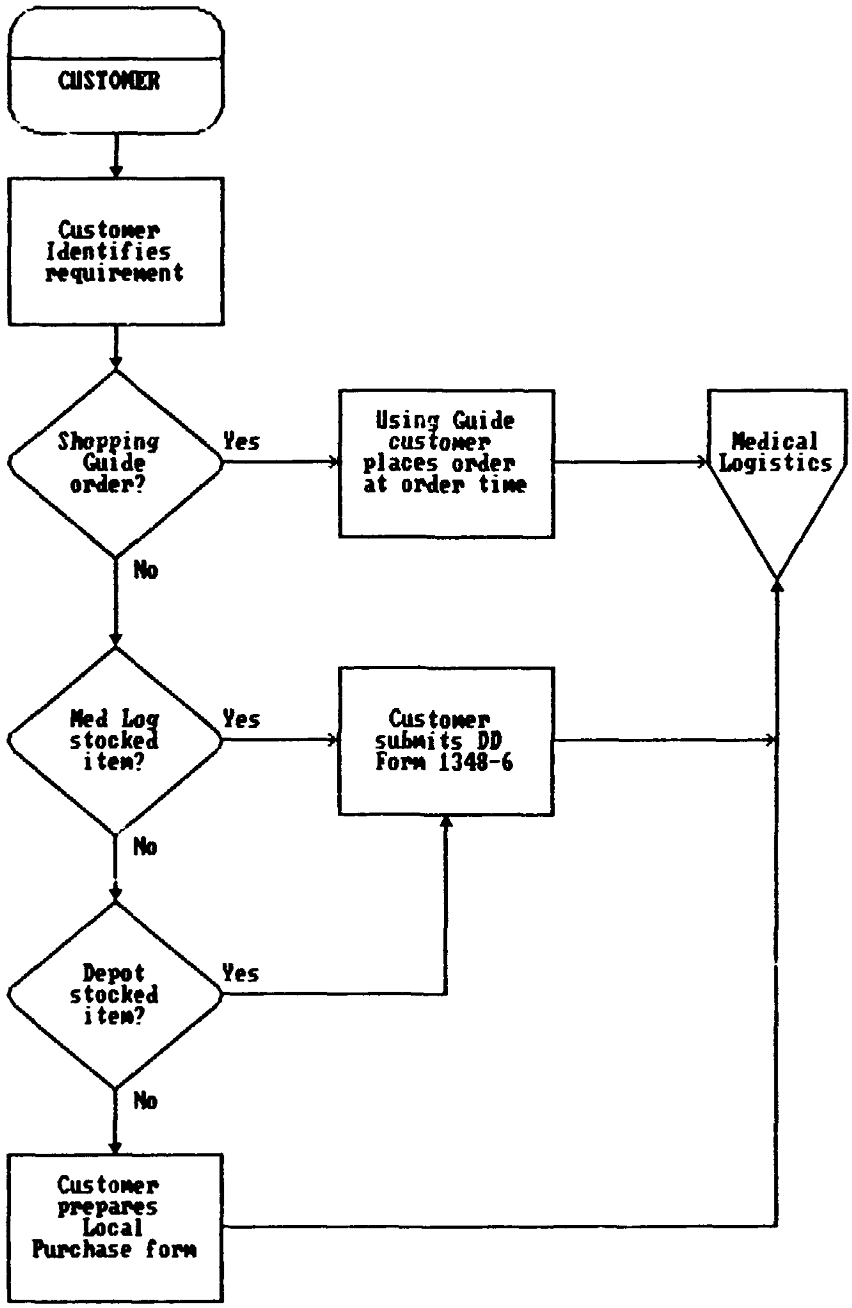


Figure 10. Customer Requisitioning Process

product of the Medical Logistics System (MEDLOG), which will be discussed further under the Medical Logistics process section. The Shopping Guide is a list of items routinely used by the customer. In some locations, such as Wright-Patterson Air Force Base, customers may call in their orders during the specified times and simply provide their names and account numbers, the date of the Shopping Guide, and the index numbers and quantity of the items desired. In other locations, quantities are marked on the Guide, and the order is handcarried to Medical Logistics (Dawson, 1991).

If the item the customer desires is not on the Using Activity Shopping Guide, and it has a valid stock number, a DD Form 1348-6 (DOD Single Line Item Requisition System Document) is submitted to Medical Logistics. Depending on the priority of the requirement, the document may be sent through distribution or handcarried. Although the customer may have several products available in his area which can be used to determine if an item has a national stock number (NSN), the Customer Service Section of Medical Logistics is available to help in the endeavor.

There are two instances when a customer requirement results in a local purchase. In one, the central manager of the item determined that it should be procured locally even though there is an NSN assigned. In the other instance, the customer requires an item which does not have an NSN. In both cases, the customer prepares a local purchase form.

The format of the form varies depending on the location of the base or activity, and local procedures determine who must review and coordinate. However, for Air Force requisitioning, all must follow the procedures outlined in Air Force Manual 67-1, Vol 5, Chapter 16. Local purchase forms must be signed by the department chief of the requesting activity and approved by the Director of Base Medical Services, or the designated authority (DAF, 1989:7).

It is the customer's responsibility to fill out the local purchase forms completely to ensure proper processing. Customers are asked to provide as much information as possible and to attach product literature if it is available since the purchase request will most likely be prepared by someone with no medical experience. An example of an item which might be purchased locally is a brand name product for a patient who is allergic to the generic one stocked (Tam, 1991).

There may be occasions when medical supplies are necessary to save a life or to prevent suffering. In those instances emergency calls may be made to Medical Logistics, and if the item is in stock, it is delivered immediately. If the item is normally locally purchased, the Director of Base Medical Services, or other competent medical authorities may direct the purchase of the item without prior processing by the base contacting office. When this occurs, the individual who made the purchase documents the actions following detailed instructions prescribed by the activity and regulation (DAF, 1991:16-9). For overseas activities, emergency requirements may be sent to the DPSC Medical Emergency Supply Operations Center by telephone, message, or other expeditious means of communications.

Medical Logistics Processing

The mission of the Medical Logistics organization (a function under the purview of the medical facility) is to provide optimum logistical support to its customers and to properly manage its Air Force medical/stock fund account. This includes maintaining medical readiness and patient care. The organization also is responsible for maintenance and repair of medical equipment, and is charged to keep their customers appraised of logistics policies (Harkenrider, 1990).

There are several sections within the Medical Logistics management office which may become involved in the process of requisitioning medical supplies: Stock control - responsible for ordering, materiel complaints, entering materiel receipts into the database, and distributing customer reports; Warehousing - responsible for issuing, receiving, and delivering materiel; Requisition Management - responsible for follow-up on overdue requisitions and processing the appropriate paperwork when discrepant orders are received; Local Purchase - responsible for obtaining items which are not available through the depot; Customer Service - responsible for assisting customers in locating national stock numbers, filling out requests for local purchases, and obtaining status on backorders (WPAFB Med Center, 1990).

Medical Logistics System (MEDLOG). Many of the responsibilities of Medical Logistics are accomplished using the standard Air Force Medical Logistics System (MEDLOG). MEDLOG is an on-line system based on the concept that records for medical facilities and contingency hospitals should be maintained using a stand-alone minicomputer. The records are updated by processing information from medical materiel source documents, internal computer program criteria, or transactions received via AUTODIN or diskette from Base Contracting or Base Finance (DAF, 1989:2-1).

AUTODIN transactions from the Defense Automatic Addressing System (DAAS), which is responsible for routing all requisition transactions to the appropriate addressee or source of supply, are received by Medical Logistics through an interface with the Base Level AUTODIN Message Extract System (DAF, 1989:2-5). The AUTODIN transactions are printed to a diskette file, and the diskette is forwarded to Medical Logistics where it is read into MEDLOG.

MEDLOG's configuration consists of a distributed network of Datapoint hardware including data, control, and application processors, line and character printers, and workstations. There are over 100 printed listings produced by the MEDLOG system, many of which may be used to determine how well Medical Logistics is serving its customers and how well Medical Logistics is being served by the sources of supply. The MEDLOG system may operate in a peacetime or wartime mode (DAF, 1990:2-2).

Stocked Item Requisition Processing. When a customer order is received in Medical Logistics, the form of the request determines the order fulfillment process. Figure 11 is a flowchart of the first steps taken by Medical Logistics to satisfy a customer's requirement for a stocked item.

At the close of the time period for placing Shopping Guide orders, a clerk in the Stock Control Section enters the orders into MEDLOG, and mass issues are processed. If the warehouse cannot fill the request, the item is backordered, and the notation appears on the customer's weekly Using Activity Issue/Turn-In List. The customer is responsible for checking each entry on the list to ensure every item on the list was delivered or appropriately coded. Shopping Guide orders are pulled and delivered daily, normally on a pre-determined schedule. At Wright-Patterson AFB larger accounts such as the pharmacy are pulled and delivered first, but all orders are delivered within the week (WPAFB Med Center, 1990).

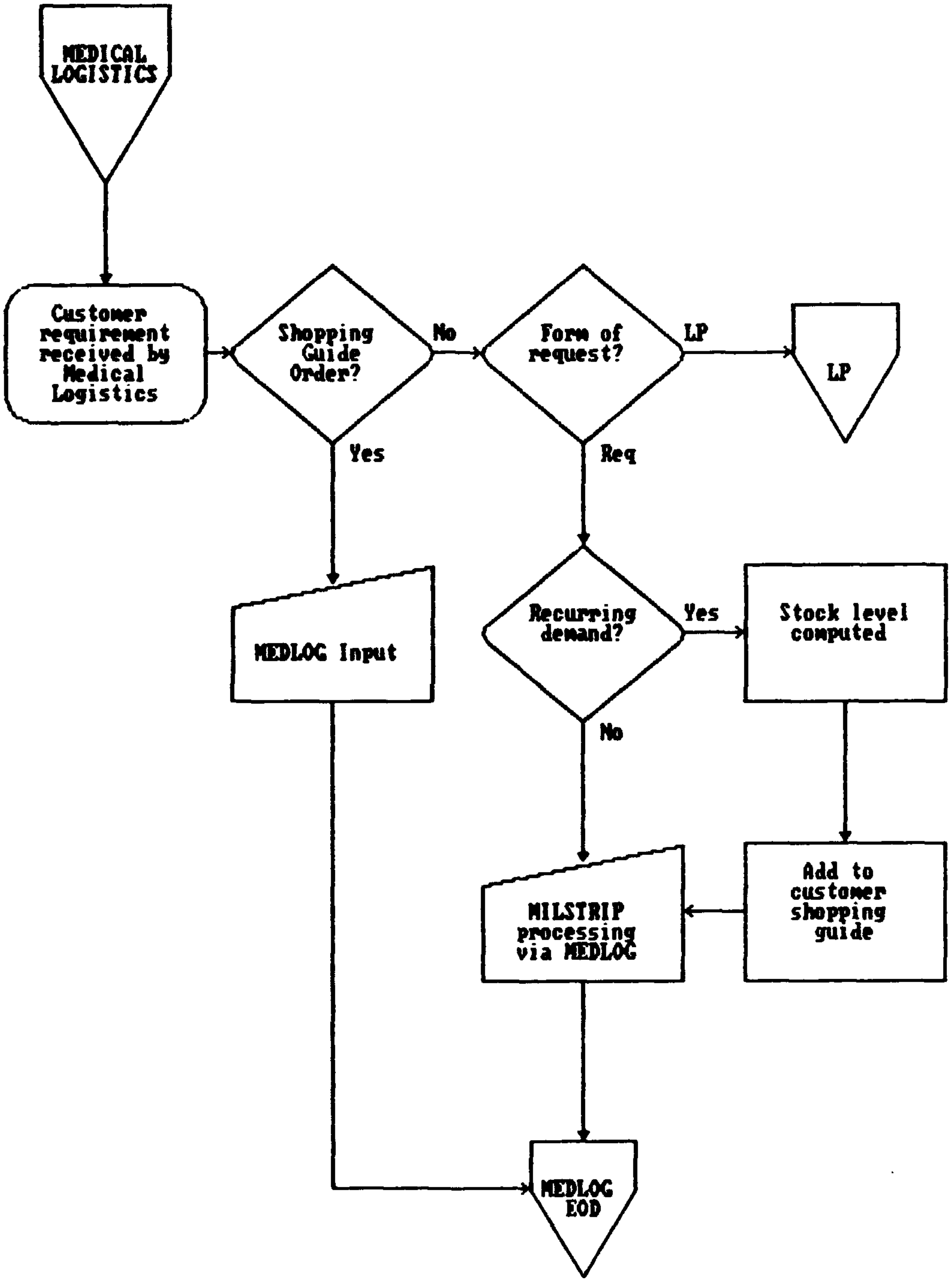


Figure 11. Medical Logistics - Stocked Item Requisition Process

If the form of a request is a DD Form 1348-6, and the customer has noted the item will have recurring demand, a stock control level will be set manually or the computer will set/adjust the level during processing. A computed stock control level considers: a safety level quantity, a pipeline time quantity, and the economic order quantity (DAF, 1990:8-10). The customer will have indicated whether the item should be added to the Shopping guide, and Medical Logistics ensures that a new Guide is produced for the customer, if necessary. A clerk in Stock Control enters the requisition into MEDLOG.

As a result of end-of-day (EOD) processing, the item is issued the following day if stocked by Medical Logistics; otherwise, the requisition is included in the outgoing AUTODIN file and transmitted to the source of supply, usually DPSC.

Local Purchase Processing. When requests for local purchase arrive at the Local Purchase Section of Medical Logistics, they already have been approved for processing. The section works the requests in order of priority (Tam, 1991). (See Figure 12 for a flowchart of the local purchase processing.) To ensure the item is not federally stocked, the local purchase clerk may peruse several research products, including the Medical Catalog (MEDCAT), microfiche produced monthly by Defense Logistics Service Center. At Wright-Patterson AFB the tool used most frequently is the

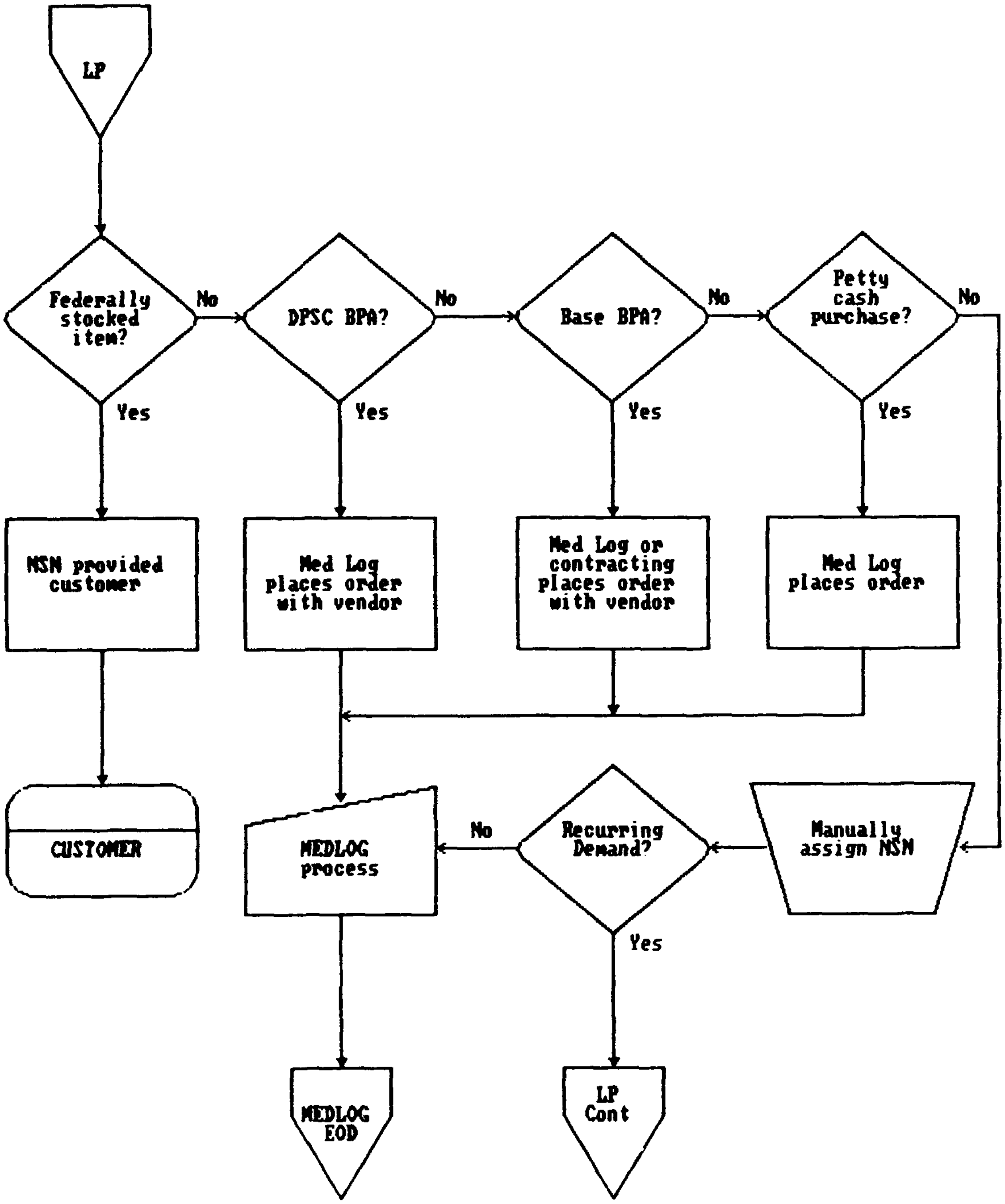


Figure 12. Medical Logistics - Local Purchase Processing

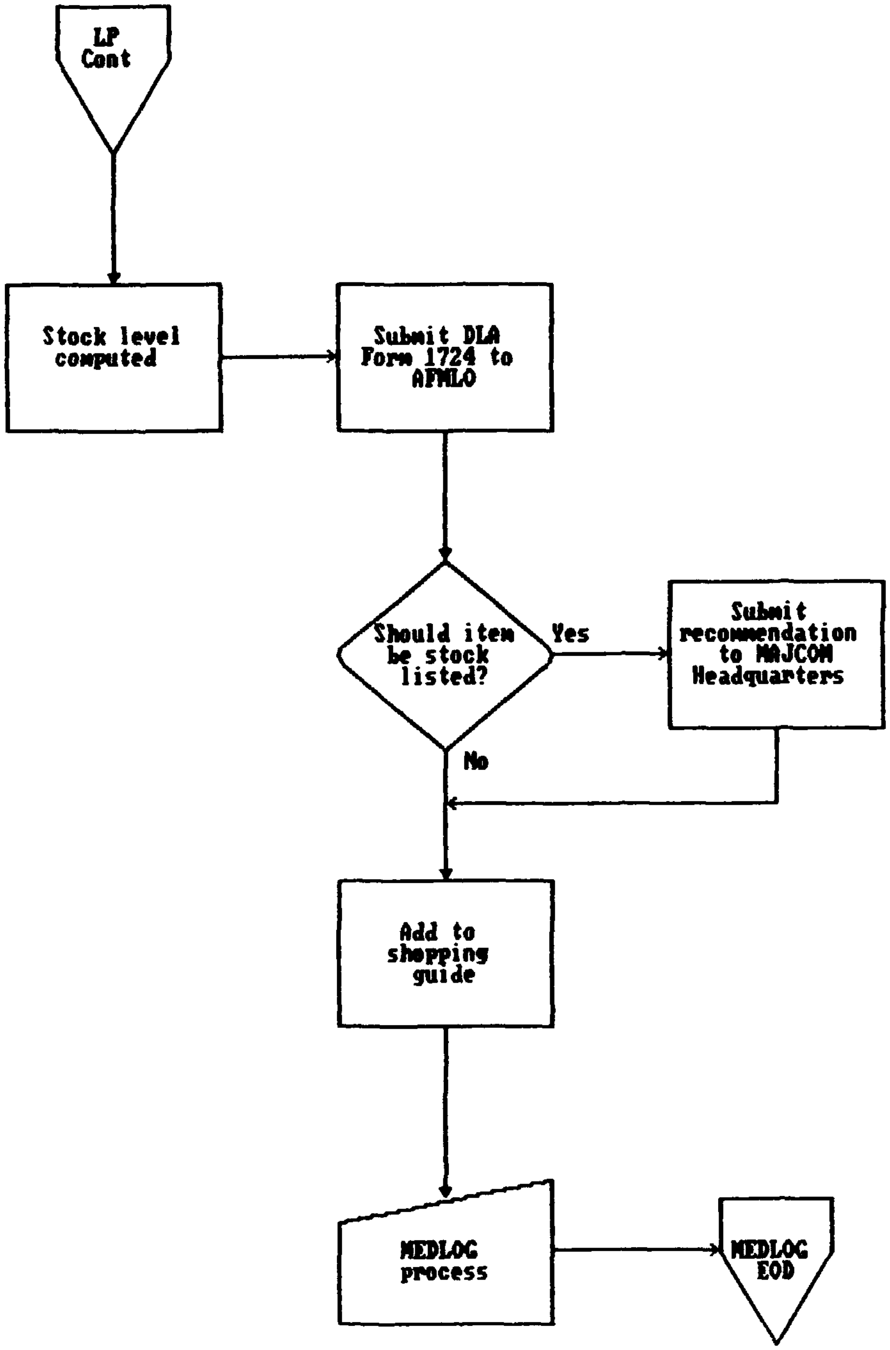


Figure 12. Medical Logistics - Local Purchase Processing (Cont)

Haystack. The Haystack system is a contractor supplied, stand-alone computer with read-only memory containing information on medical items. The data is updated monthly, and the clerk may search by supplying a stock number, part number, vendor name, key word, etc. (Howard, 1991). If a valid NSN which is not coded for local purchase is found, the information is provided back to the customer so the item may be requisitioned via MILSTRIP (Tam, 1991).

If the base is within CONUS, the item has a valid stock number, and is coded for local purchase, the clerk checks the on-line vendors file to see if there is a blanket purchase agreement with the company identified by the customer (Tam, 1991).

The vendors file contains a record for each company who supplies local purchases items under a blanket agreement. Each time the record is accessed, the transaction date for that particular vendor is updated. On a monthly basis, Medical Logistics reports all blanket agreement actions to Base Contracting. Actions on DPSC negotiated agreements are reported to the Air Force Medical Logistics Office (AFMLO) on an annual basis (DAF, 1991:16-14).

Decentralized Blanket Purchase Agreements (BPAs) are pre-existing DPSC negotiated contracts with various suppliers of medical items, which may be used by any Air Force base. DPSC usually administers the contract for facilities OCONUS; within CONUS, orders under BPAs may be placed by Medical Logistics personnel directly with the vendor.

Once the order has been placed with the vendor, the local purchase clerk will input the transaction into MEDLOG and the appropriate documents, including a purchase order, and status will be generated at EOD processing. The status will be passed to the customer on the Using Activity Issue/Turn-In List (Dawson, 1991).

At some locations Base Contracting may have negotiated BPAs for items which are local purchase and are required on a recurring basis. Once again the local purchase clerk checks the vendor file to see if the item and vendor identified by the customer are on the list. The terms of the agreement identify who is authorized to place orders. If Medical Logistics has the authority, the order is placed and the clerk enters the transaction into MEDLOG. If Medical Logistics does not have the authority, the clerk enters the transaction into MEDLOG, and the requisition is passed to Base Contracting with EOD processing (WPAFB Med Center, 1990).

Blanket purchase agreements do not relieve Medical Logistics of the responsibility to follow the Federal Acquisition Regulation concerning competition and small business set asides. If the BPA is written against a federal supply schedule, the Medical Logistics manager is responsible for strict compliance with the terms and conditions of the schedule. BPAs negotiated by DPSC are published in the Air Force Medical Logistics Letter distributed by AFMLO to all supply custodians (DAF, 1991:16-13).

Another method of local purchase is to use the Imprest (petty cash) Fund which is available for certain requests valued at less then $500. For example, emergency medical purchases may be procured using petty cash. Orders are placed C.O.D. or are available locally for customer pickup or delivery. These orders are placed by Medical Logistics and the lead times are very short. When this occurs, all transactions (requisition, issue, and receipt) are entered into MEDLOG at the same terminal session (Slater, 1991).

The last local purchase situation faced by the section is when the requirement is for an item either without an NSN or with an NSN, but without a demand history. The local purchase clerk assigns a stock number (if necessary), and using the information provided by the customer, determines if the item will have recurring demand. Depending on the item, customer, and other relative criteria, it is determined if a stock control level should be set or if the computer should be allowed to set the level. Next the determination is made whether the item should be recommended for stock listing. If it is, the recommendation is forwarded through command channels to Hq Air Force Office of Medical Support, Brooks AFB TX (DAF, 1991:16-11). Based on the customer's request, the clerk then takes action to add the item to the Shopping Guide, if necessary. Finally, the transaction is input into MEDLOG and the requisition is passed to Base Contracting at EOD processing.

Air Force bases located in Alaska, Guam, and Hawaii may pass local purchase requests to Base Contracting if there is a local source of supply; DPSC provides the support if a local source of supply is not available (DAF, 1991:16-8).

Overseas bases at locations other than those listed above process purchase requests to Base Contracting for procurement of medical items in the local area if a Federal Drug Administration approved drug and source of supply is available. The procurement also must not be prohibited by the balance of payments program. DPSC provides all other local purchase support (DAF, 1991:16-8).

Customers at Wright-Patterson AFB are told to plan for 90 - 120 days average lead time for new items being purchased through Base Contracting and 45 - 65 days for recurring items (WPAFB Med Center, 1990). At one overseas location, customers are told to plan 30 days for priority 3, 60 days for priority 6, and 120 days for priority 13 requisitions for local purchase (Harkenrider, 1990).

<u>MEDLOG End-of-Day (EOD) Processing</u>. Although MEDLOG is an interactive system, due to lengthy processing times, most applications are run in the batch mode (Dawson, 1991). EOD processing updates the database, produces printed reports

and purchase orders which were not printed on-line, and generates an outgoing AUTODIN file consisting of requisitions and follow-up transactions (See Figure 13). This AUTODIN file, in the form of a diskette, is handcarried to the Base Communications Center which is responsible for relaying order data to DAAS via AUTODIN. Floppy disks are also created for Base Contracting and the Base Accounting and Finance Office.

Three other important EOD processing products are the Issue/Backorder List, the Requisition Trouble List, and the Medical Materiel Requirements List. The Issue/Backorder List is produced for the customer, and the customer is responsible for reviewing the list to confirm order receipt and determine what was not available (backordered). The Requirements List is a computer generated list of new and continuing stock requirements. During computer processing, the reorder point for items is assigned programmatically based on average pipeline time, safety level, and economic order quantity. When the stock on hand plus due-ins minus due-outs equals or is less than the reorder point quantity, a requirement exists to replenish the item to the stock control level and the item is printed on the Requirements List (DAF, 1990:8-1,8-9).

Once the Requirements List is reviewed and the decision to order stock is made, a MEDLOG transaction is released by a clerk in the Stock Control Section. The transaction

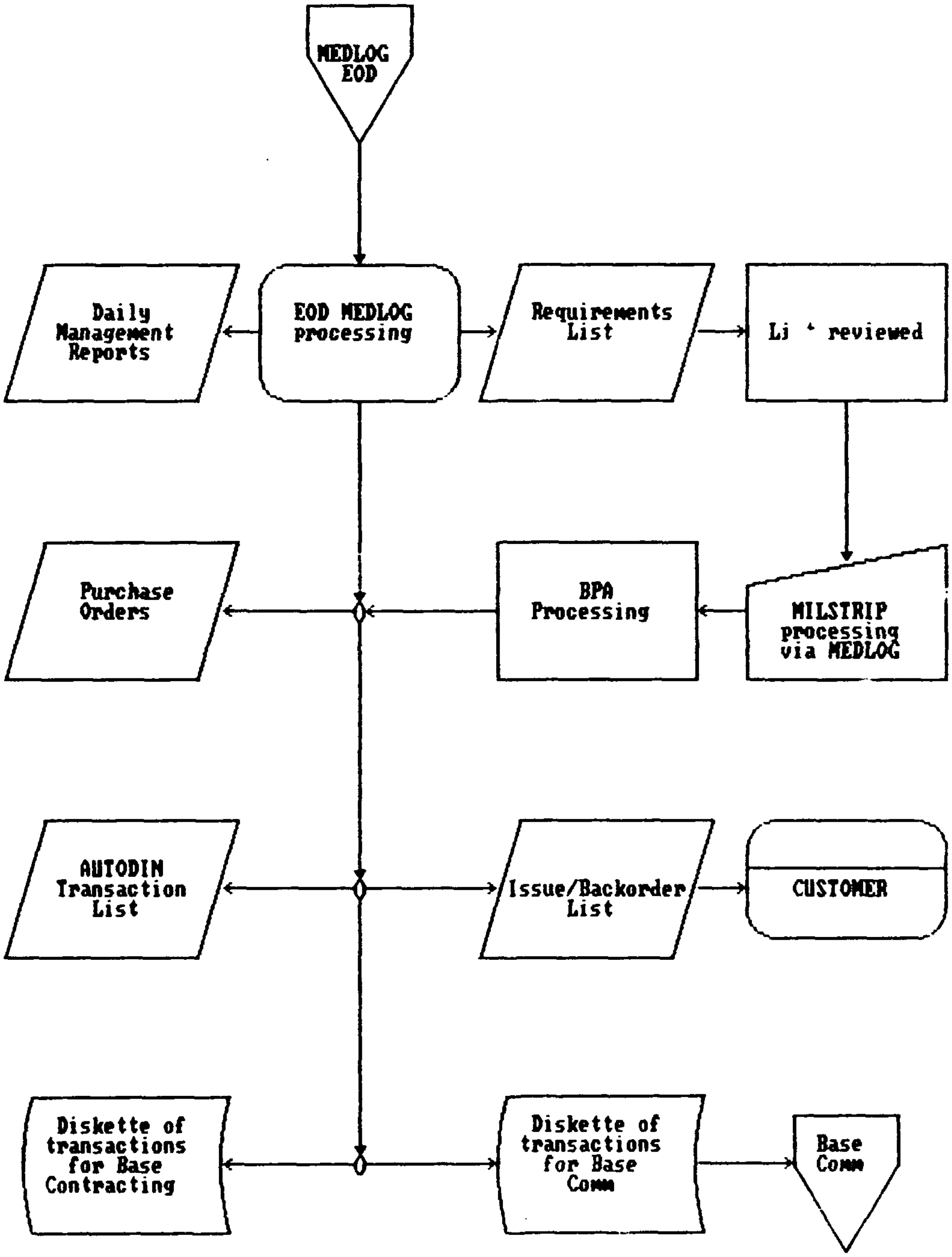


Figure 13. MEDLOG End-of-Day Processing

establishes a due-in detail and generates a requisition image to the AUTODIN file. If local purchase items are to be procured, purchase orders will print for items covered by a BPA or transactions will be generated for Base Contracting. These transactions can be processed on-line or batched with EOD processing. As a result of processing requirements for local purchase items, the Stock Number to Document Number List is produced which may be used later for tracking purposes (DAF, 1990:8-1).

Another important report produced by EOD processing is the Requisition Trouble List. Part IV of the report, which is important for receipt processing, lists all requisitioned items which have a purchase order number assigned. The list is important because it provides a cross reference from purchase order number to the requisition document number. Another section of the report can be used to identify delinquent shipments.

Receipt Processing. Since the flowcharts and description of the requisitioning process follow an outward or forward stream, receipts by Medical Logistics are not included in the picture. However, it could be said that warehousing is "where the action begins," since until then, only the information flow is involved.

Shipments from the depot are delivered to the base transportation office where they are unloaded and segregated by account. Medical Logistics personnel pick up the items and return them to the Warehousing Section for processing. Deliveries arriving at the Medical Logistics dock originate from a variety of sources and the type of delivery document varies. Items arriving from the depot include DD Forms 1348-1, DOD Single Line Item Release/Receipt Documents. The packing list, on the outside of each package containing consolidated shipments from the depot, specifies the document numbers of the requisitions included in the shipment. Deliveries from vendors under a BPA include DD Forms 250, Materiel Inspection and Receiving Reports.

As items are unloaded, a preliminary inspection is made of the condition of the shipment containers. Next, the containers/packages are opened and a comparison is made between the receiving documents and identification and quantity of items received. Any discrepancies are noted on the receipt documents, and the items are processed for shelving. If there is an existing backorder for the item or if it is a one-time purchase, it will be set aside for direct delivery to the customer.

The usual process at Medical Logistics is for stocking to occur at night. Once the items have been put on the shelves, the annotated receipts are passed to Stock Control the following morning, and the receipts are entered into MEDLOG. During this process the pipeline time also is automatically recorded if the requisition is for a routine, recurring requirement (DAF, 1990:9-10). Receipt acknowledgement transactions also are automatically generated for the source of supply, and will be released in the AUTODIN file at end-of-day processing (DAF, 1990:9-11).

A glance back to the general pipeline in Figure 9 reveals that customer orders for medical supplies flow from Medical Logistics to either Base Contracting or DPSC. Since the focus of this thesis is the DLA process, a description of the inventory control point processing at DPSC follows.

Defense Personnel Support Center (DPSC) Processing

The majority of requisitions arrive at DPSC via the Automatic Digital Network (AUTODIN), routed there by the Defense Automatic Addressing System (DAAS), because it is the inventory control point (ICP) for that particular item (national stock number). A computer at DPSC receives the AUTODIN requisitions and stores them in a file for batch processing into the Standard Automated Materiel Management System (SAMMS), the central requisition processing system. SAMMS initially screens and processes the vast majority of the requisitions arriving at DPSC.

Designed in the 1960s and installed in 1974 for medical commodities, SAMMS is primarily a batch processing system which includes five interfacing subsystems: Requirements, Distribution, Technical, Contracting, and Financial which are updated through multi-daily runs. SAMMS also produces numerous management reports which may be used for monitoring workload and performance. The system provides requisition status to DPSC customers through AUTODIN.

One of the first SAMMS system checks is to ensure the NSN ordered has been routed to the appropriate ICP. If the NSN on the requisition is not for a medical item, SAMMS will automatically query the Defense Logistics Services Center (DLSC) so that the routing identifier code can be changed, and the requisition will be re-routed. Once it has been confirmed that the requisition is for a medical item, and the transaction has passed MILSTRIP validation (ensuring the necessary codes are in the appropriate positions on the record), the requisition becomes the responsibility of the Directorate of Medical Materiel (Mawhinney, 1991).

Divisions within the directorate which may become involved in the requisition of a particular item include: Supply Operations which is responsible for requisition processing, customer assistance, and inventory management; Contracting and Production which is responsible for depot stock replenishment, direct vendor delivery purchasing production management, and emergency procurement; Technical Operations which is responsible for cataloging, item identification, technical data management, and specification writing (DPSC, 1991).

Directorate of Medical Materiel Processing. Although the focus of this thesis is related to routine requisitions for medical operating inventory, the directorate is responsible for processing emergency and high priority requisitions as well. Normally, requisitions arrive via AUTODIN as previously described. However, emergency (life or death situations) and high priority orders may arrive via telephone, message, or telefax addressed to the Emergency Supply Operations Center (ESOC) Branch of the Supply Operations Division. A customer service representative records the request on DLA Form 934, Exception Requisition Document/Data Input, and the data is input into SAMMS using the real time or batch data entry system.

ESOC is responsible for completely processing all emergency and high priority requisitions including purchasing, arranging transportation, tracking, updating SAMMS, and informing the customer of the status of the request. The ESOC averages 26 life/death requisitions per month. It receives approximately 707 requests by message or telefax per month; 1,130 by telephone (DPSC, 1991).

Once a requisition has passed the SAMMS MILSTRIP validation, there are numerous (possibly hundreds) system checks which might affect the distribution policy for the item being ordered or flow of requisition through the system (Mawhinney, 1991). Some of the more prominent checks are discussed in the following paragraphs, and are shown in Figure 14.

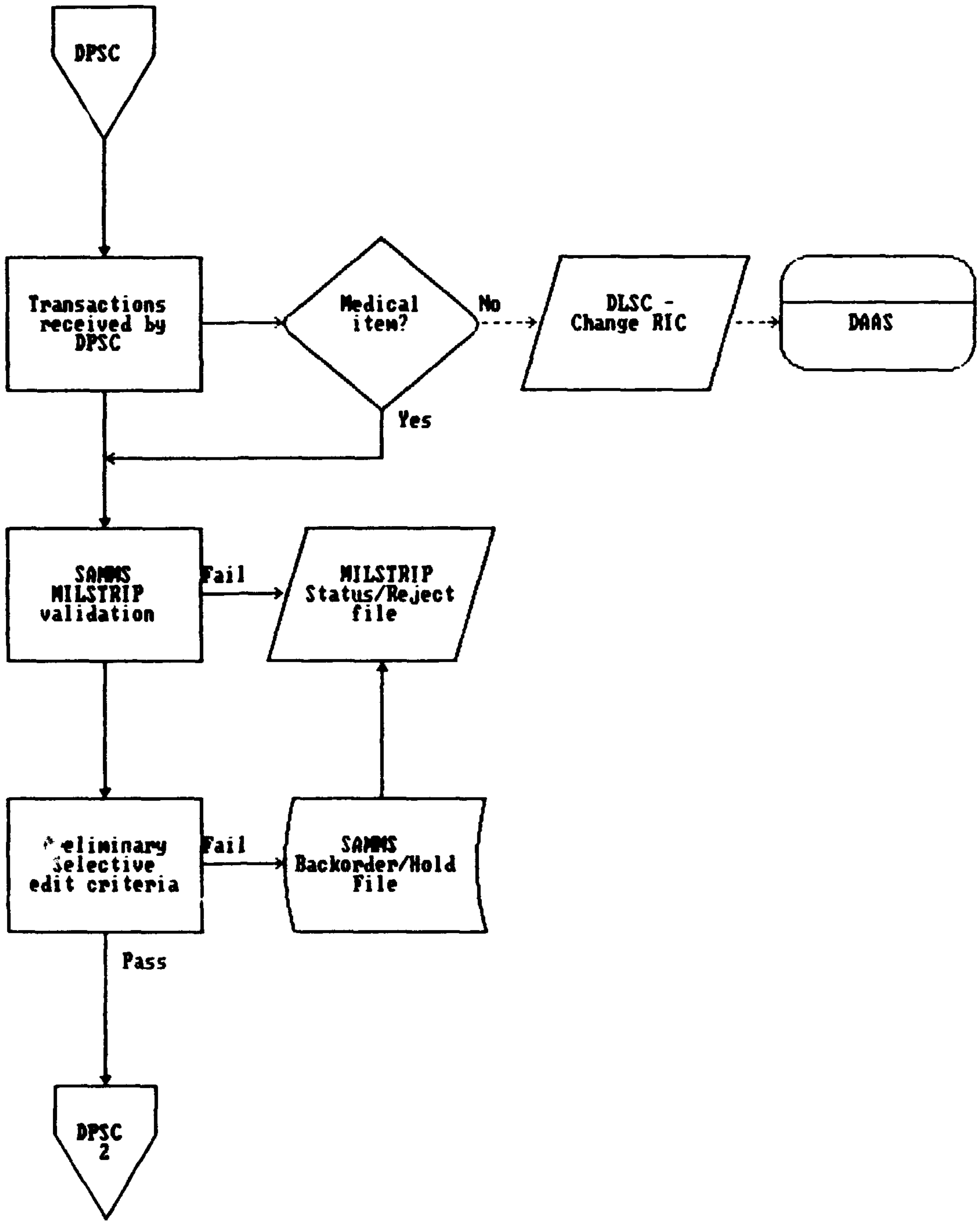


Figure 14. DPSC - SAMMS Preliminary Processing

One important check is to determine if the NSN ordered is affected by a special agreement concerning the particular item. For example, the requisition must have a special customer code if the order is for a controlled substance. For the Air Force, certain war reserve materiel requisitions may be rerouted to the Air Force Medical Logistics Office at Fort Detrick, Maryland. Requisitions failing such edits are returned to the customer, passed as provided in the tables, or held pending further instructions from the customer (Mawhinney, 1991). Once a requisition has passed the preliminary edits, it is then determined if the order is for a stocked or non-stocked item.

Stocked Item Requisition Processing. The flow of the requisition continues as shown in Figure 15. If the requisition is for a stocked item, there is a check to determine if the item is affected by a backorder policy. A backorder policy may be applicable if the requisition is for Foreign Military Sales, prepositioned war reserve materiel, or a required delivery date was supplied by the customer.

For routine (priority 9 - 15) requisitions, SAMMS then checks the NSN in the national inventory record file to determine if the on-hand quantity is greater than the minimum stock level computed based on UMMIPS standards. If the quantity on hand is less than the standard, the requisition is given a backorder status and moved to the hold file. The backorder status and an estimated shipping

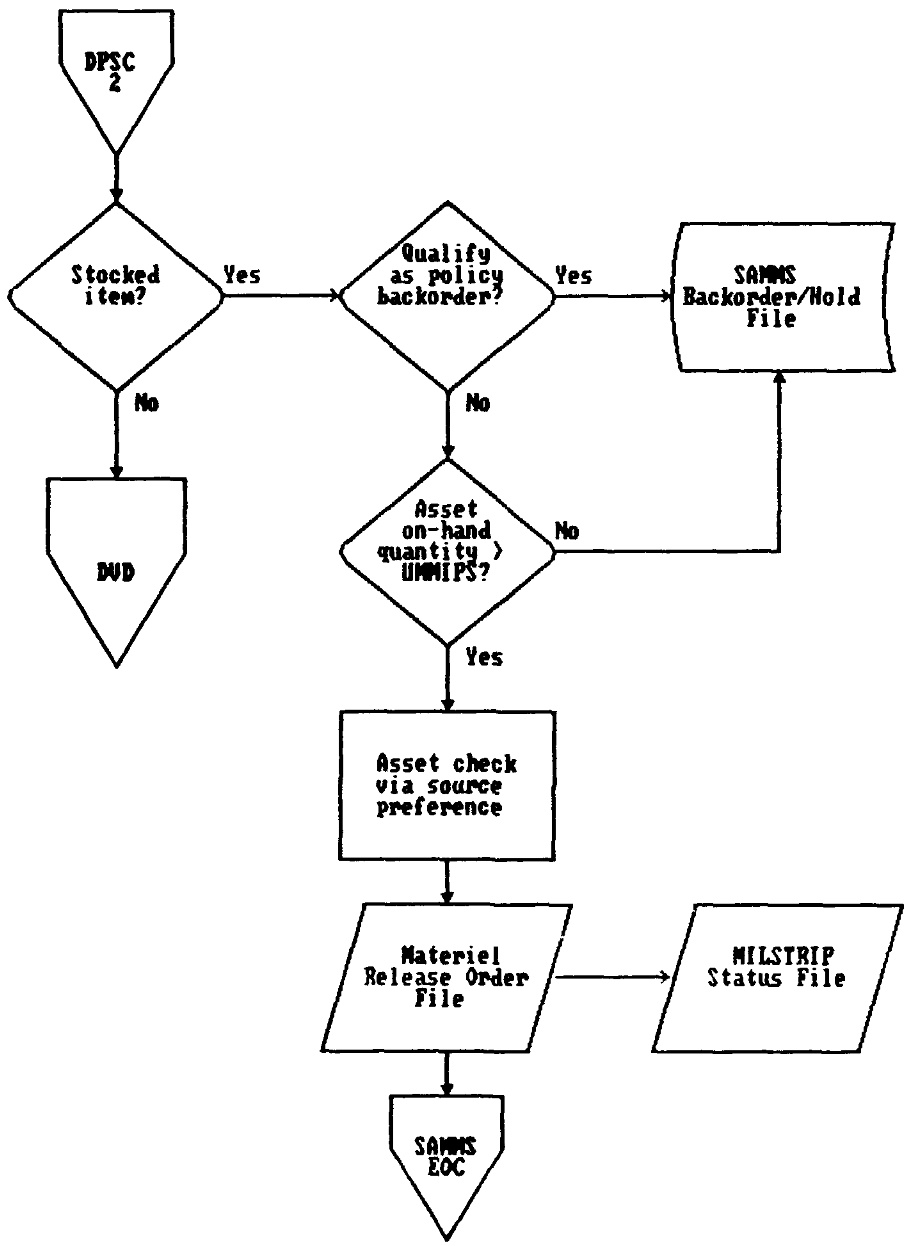
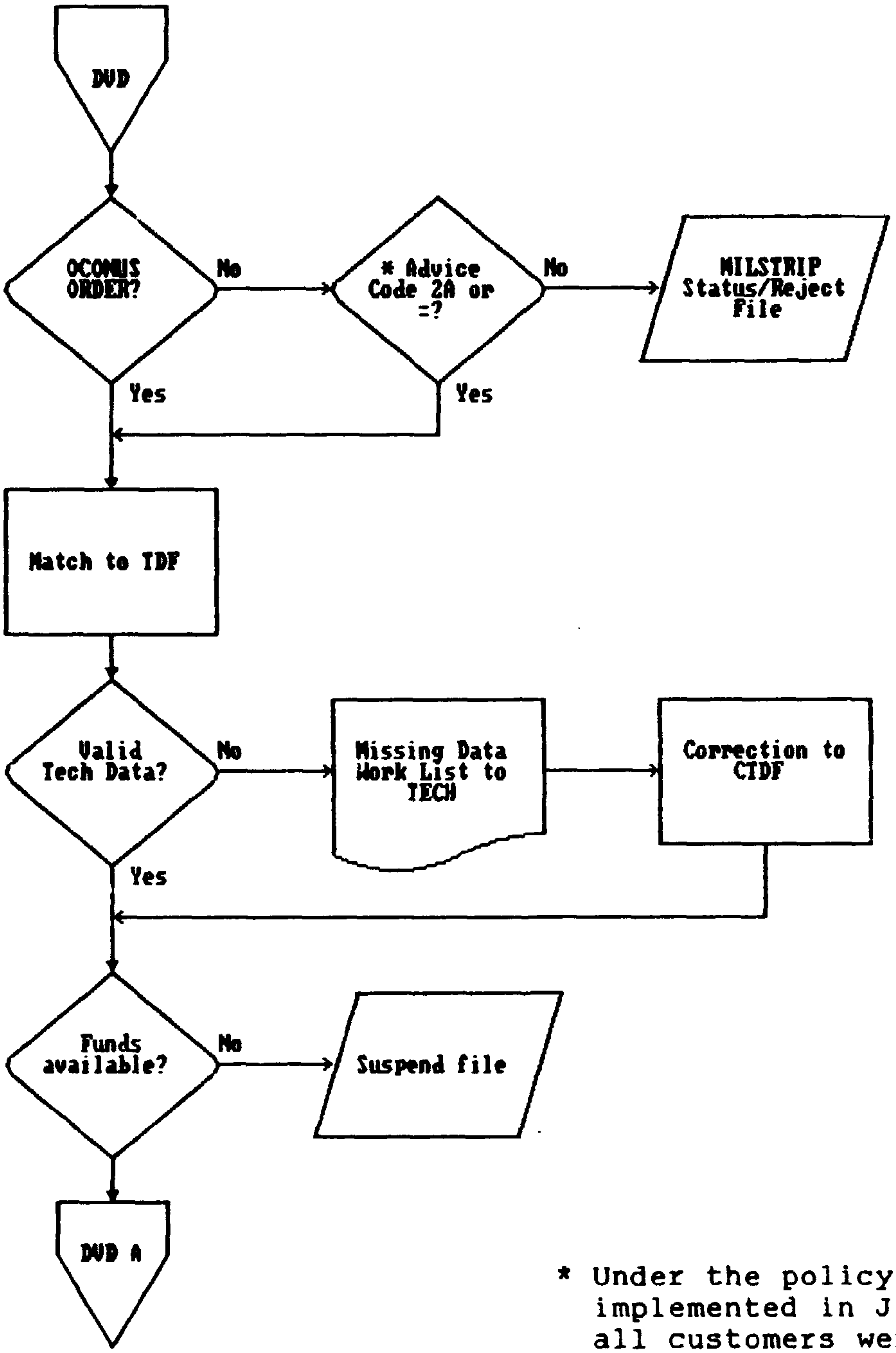


Figure 15. DPSC - Stocked Item Requisition Processing

date are supplied for the customer. If the on-hand quantity is greater than the standard, SAMMS assigns a status to the requisition which indicates the item is being processed for release and shipment, and the requisition continues through the process. High priority requisitions will process without backordering (Mawhinney, 1991).

The next step in the process is to match the geographic location of the customer with the location of the preferred storage depot. SAMMS then generates a materiel release order (MRO) for the storage depot in the geographic region serving the customer. The MRO will be transmitted to the depot via AUTODIN at the end of the processing cycle. SAMMS usually completes two cycles per day, Monday - Friday; one per day on weekends (Miraglia, 1991).

Non-Stocked Item Requisition Processing. If the requisitions is for a non-stocked item, the process continues as shown in Figure 16. The next system check is to determine if the order is from an overseas customer or if the requisition status indicates the customer has been unable to purchase the item locally. If the requisition fails both checks, the order is canceled and the status passed to the customer. If the requisition passes the check, SAMMS then ensures that the technical data file contains all the information necessary for the purchase. If data is missing, the Technical Operations Division in the



* Under the policy implemented in June all customers were advised to cite an advice code 2A.

Figure 16. DPSC - Non-Stocked Requisition Processing

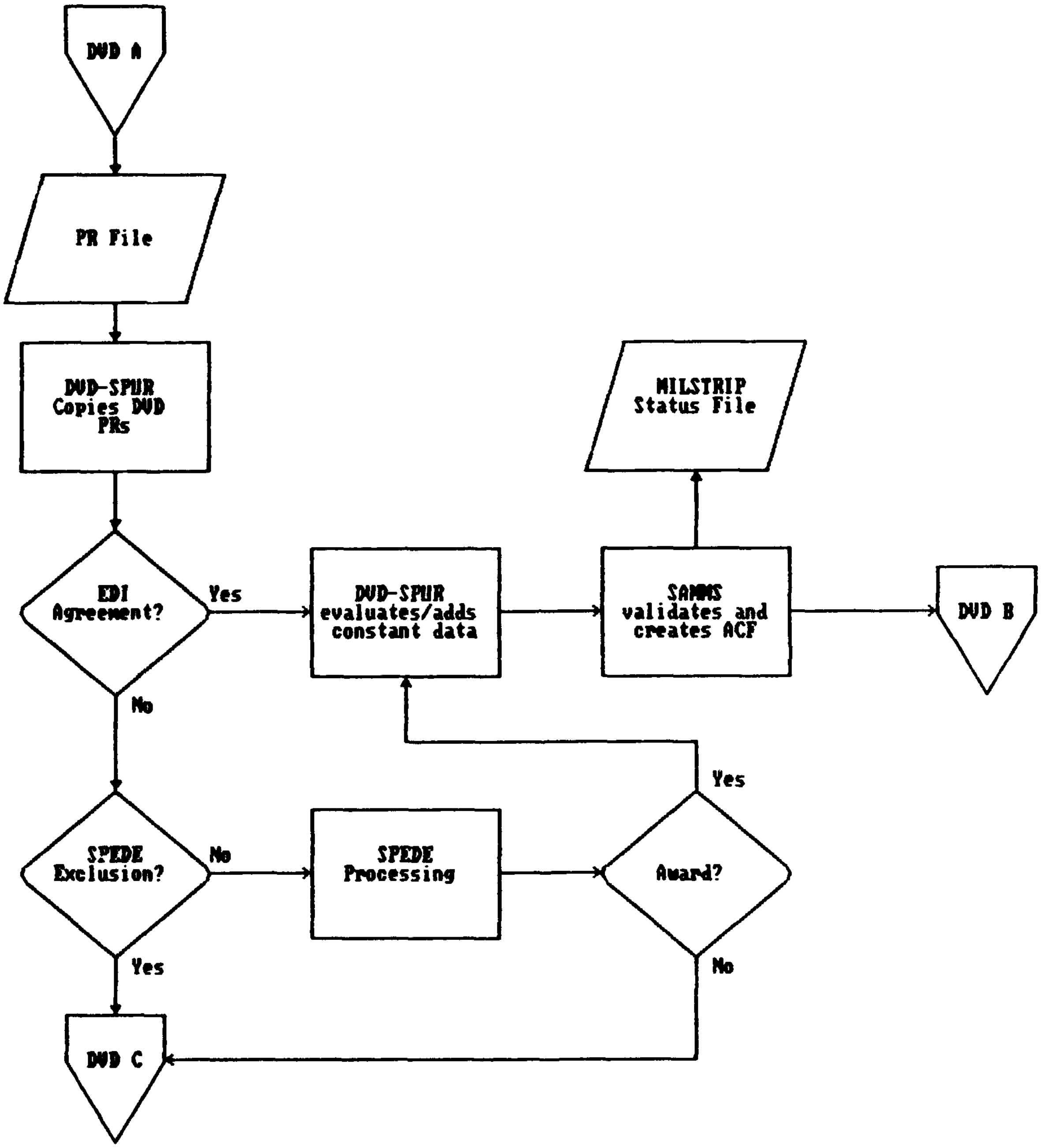


Figure 16. DPSC - Non-Stocked Requisition Processing (Cont)

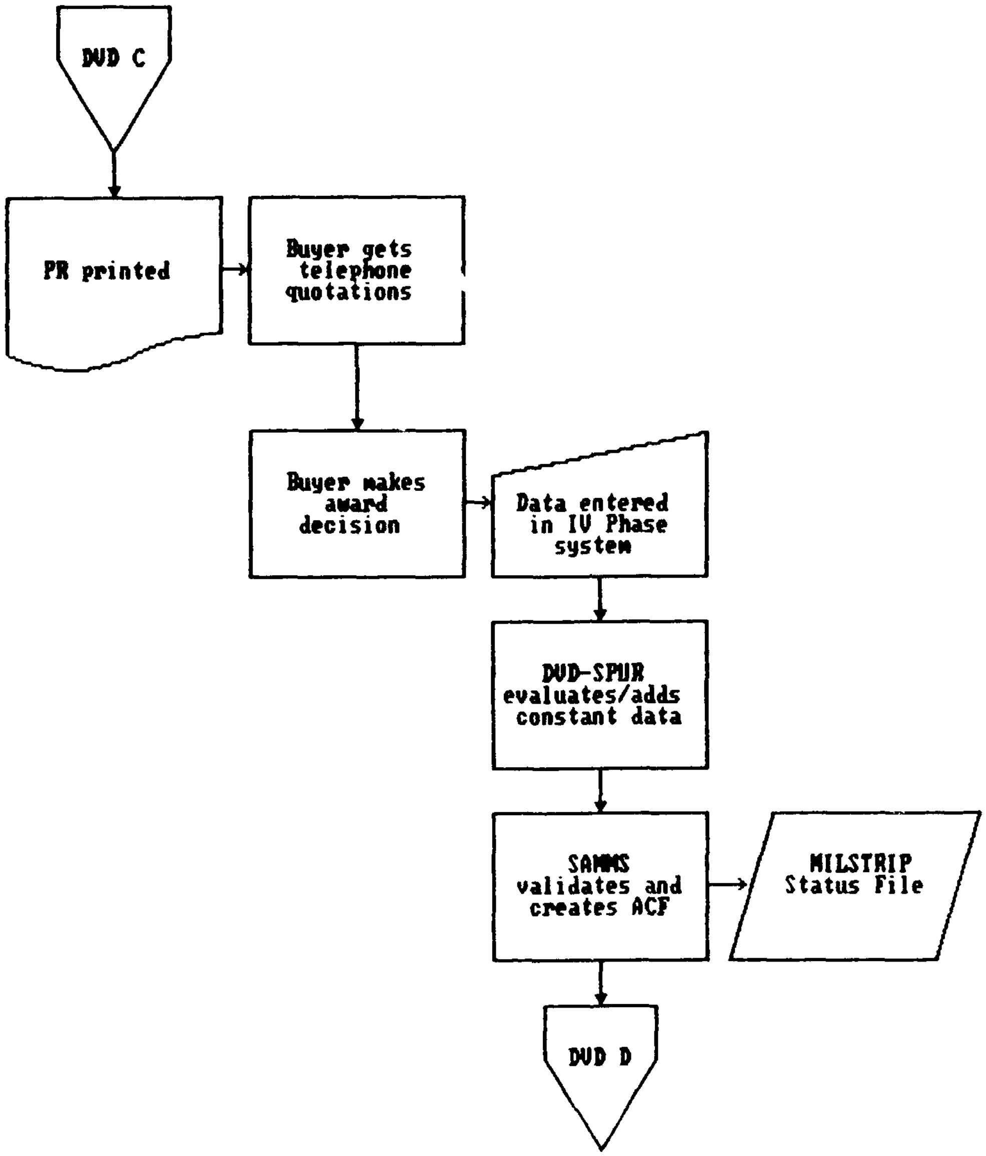


Figure 16. DPSC - Non-Stocked Requisition Processing (Cont)

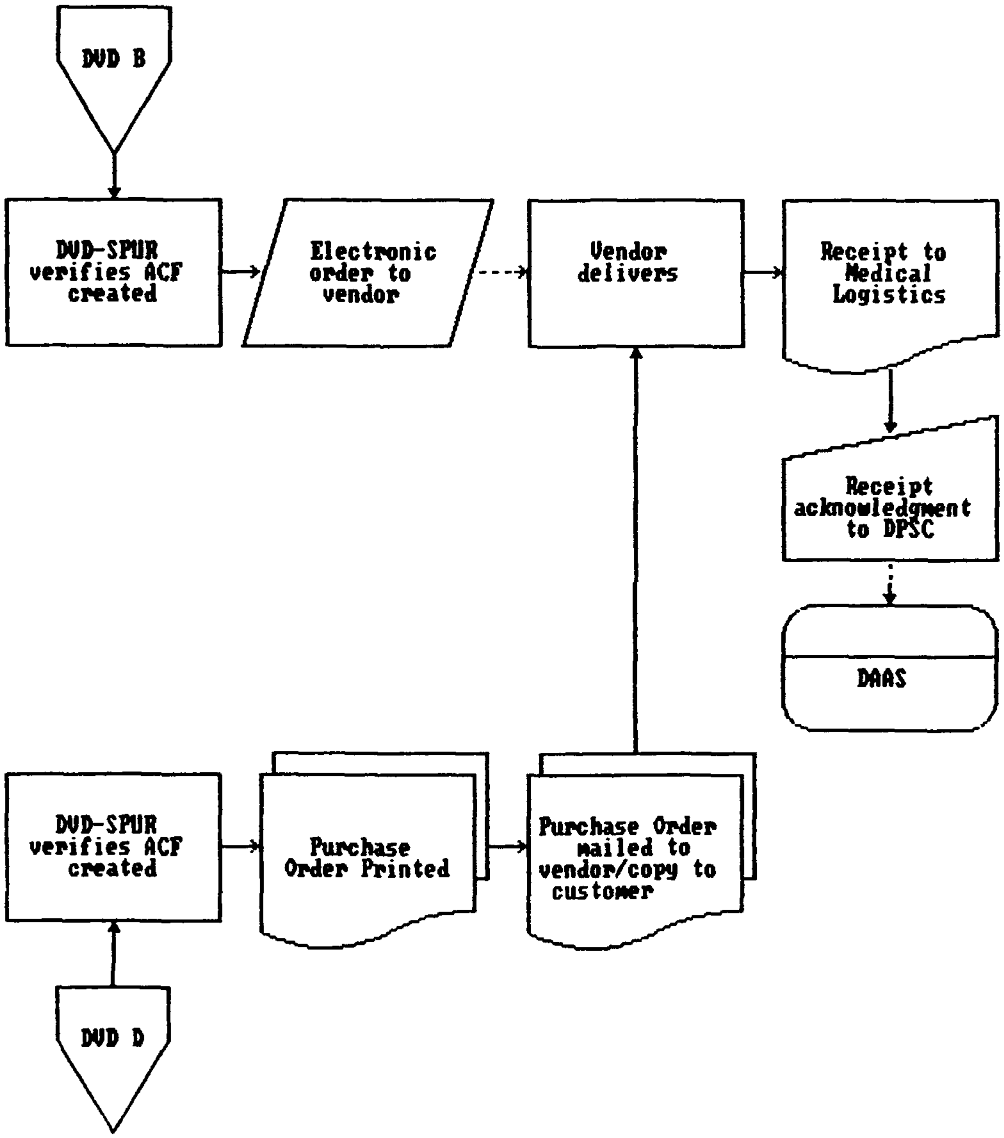


Figure 16. DPSC - Non-Stocked Requisition Processing (Cont)

directorate conducts any necessary research and updates the file, assigning an NSN if necessary (Mawhinney, 1991).

When all the necessary technical data is in the file, the next SAMMS system check is to determine if funds (commitment authority) are available. If they are not, the requisition is suspended; otherwise, the requisition continues through the process, and a purchase request is created.

There are several transaction-processing/data entry systems which provide interfaces with SAMMS and its subsystems and related files. These systems are used to pass information to SAMMS or to direct SAMMS information/ files to the appropriate file or mini-computer containing a stand-alone application. One such "traffic cop" is the Direct Vendor Delivery-Special Purchase (DVD-SPUR) system. DVD-SPUR looks at the purchase request file created by SAMMS, and copies all purchase requests for items which will be accomplished through direct vendor delivery (DVD). In this manner, the item is delivered according to the customer's instructions since it is a non-stocked item (Eisler, 1991).

Once DVD-SPUR has copied the purchase request, the next step in the process is to determine if the item is supplied by a vendor who has an electronic data interchange (EDI) agreement with DPSC. DVD-SPUR contains a file of NSNs (and the supplying vendor) which may be purchased using EDI. If there is an EDI contract covering the item being requisitioned, DVD-SPUR adds pertinent constant data from the NSN/vendor file. This transaction is passed to SAMMS, which creates an active contract file (ACF) and generates requisition status and an estimated shipping date for the customer. Once DVD-SPUR has verified that the ACF was created, the order passes electronically from the DPSC mainframe to the vendor mainframe computer (Eisler, 1991). The vendor then delivers the order according to its shipping instructions.

If there is no EDI agreement, the next check is to determine if the requisition can be processed automatically in the SAMMS Procurement by Electronic Data Exchange (SPEDE) system. DVD-SPUR contains a file of NSNs which may not be purchased electronically (e.g., Foreign Military Sales), and this file is checked before purchase requests are passed to SPEDE.

Vendors who receive orders through EDI are covered by a contract, while those who receive through SPEDE have entered into a standard blanket purchase agreement (BPA) with DPSC. While EDI orders are transmitted mainframe to mainframe (sometimes via a Value Added Network), SPEDE vendors installed Government-furnished software on their IBM compatible personal computers, and agreed to certain telecommunication procedures. SPEDE allows DPSC to pass small purchase (less than $25,000) requests for quotations, or orders and receive vendor responses electronically (LMI, 1990). There are approximately 90 small business medical supply distributors presently linked to the system, and for FY90 approximately 23 percent of the requisitions for non-stocked items were processed through SPEDE. That percentage is increasing rapidly (Rees, 1991).

SPEDE processing determines which suppliers have transactions, calls up their microcomputers, and transmits that day's purchase orders, request for quotations and award information. The following morning, the vendor checks the SPEDE system and processes any necessary transactions. If a supplier provides a quotation, DPSC eventually provides, back through the system, either an order or a notice of which vendor received the award and at what price (LMI, 1990).

If the NSN is one which may be processed through SPEDE, the purchase request either will be awarded automatically with no solicitation, three vendors will automatically be solicited, or the purchase request will be sent for manual review. SPEDE automatically can select a vendor for award if the response is in accordance with the request for quotation; or provide the buyer the capability of reviewing the response on-line and making the award if buyer intervention is required (Eisler, 1991).

Once the award has been made, as for an EDI order, DVD-SPUR adds pertinent constant data from the NSN/vendor file and the transaction is passed to SAMMS, which creates an active contract file (ACF) and generates requisition status and an estimated shipping date for the customer. Once DVD-SPUR has verified that the ACF was created, the order passes electronically from SPEDE to the vendor microcomputer (Eisler, 1991). The vendor then delivers the order according to its shipping instructions.

If DPSC is unable to purchase an NSN through SPEDE, or if after the completion of SPEDE processing an award has not been made, the purchase request is printed, and the buyer follows the manual process to award a contract.

The buyer solicits quotations via telephone and based on the information received makes an award decision. Depending on the priority of the requisition, the award may be made by telephone, or the purchase order could be mailed later in the process. Once the award has been made, the information is input into the system, and again, DVD-SPUR evaluates and adds any pertinent constant data. The transaction is passed to SAMMS which creates the ACF, and provides requisition status to the customer. DVD-SPUR verifies the ACF was created and copies of the purchase order are mailed to the vendor and the customer (Eisler, 1991). The vendor delivers the item to the customer, and the customer acknowledges receipt through DAAS.

SAMMS End-of-Cycle Processing. Figure 17 depicts the end-of-cycle processing for SAMMS. During end-of-cycle processing, SAMMS checks the backorder and suspended files and updates requisition status. MROs are passed to the AUTODIN file, and numerous management reports are created. The sales information from the cycle processing updates the various subsystems, and the requirements subsystem generates recommended buys for stock replenishment. The status of requisitions which are in the system are passed to the various DPSC customers through DAAS via AUTODIN.

Storage Depot Processing

Defense Management Review Decision 902 recently effected the consolidation of Department of Defense (DOD) depots, however, as of April 1991, storage locations for medical items were: Mechanicsburg, PA; Memphis, TN; Ogden, UT; and Tracy, CA. The depots receive, store, issue and ship DLA commodities to all branches of the military services as well as to other governmental agencies (DPSC, 1991).

As the inventory control point for medical items, DPSC passes material release orders (MROs) via AUTODIN to the supply depot holding the items and serving the geographical area of the requisitioner. (Emergency or high priority MROs may be passed via phone, telefax, handcarried, etc.) MROs

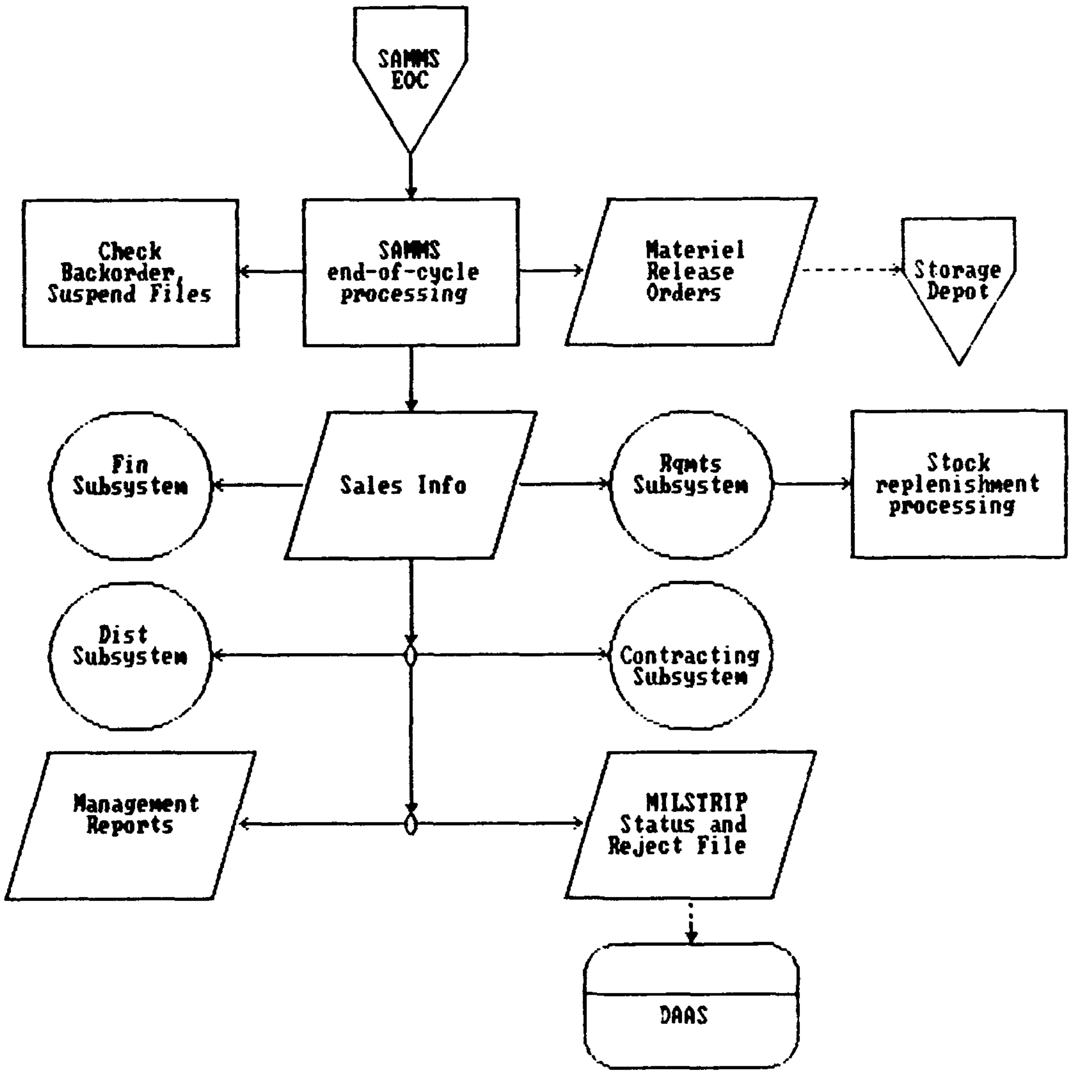


Figure 17. SAMMS End-of-Cycle Processing

are received at the depot and processed by the DLA Warehousing and Shipping Procedures (DWASP) System daily. Figure 18 depicts DWASP preliminary processing.

DWASP Processing. Once the MRO has been validated by DWASP, its issue priority group (IPG) and transportation priority are determined. Normally, the IPG determines the time segment standards for depot and transportation processing according to UMMIPS standards.

In 1990, DOD implemented a new policy which allowed automatic downgrading of all materiel movements to transportation priority 3, with the exception of MROs assigned high priorities, Joint Chiefs of Staff (JCS) project codes, Foreign Military Sales, certain other specific codes, and those with a required delivery date less than 21 days (Broniak, 1991).

In conjunction with the new policy, DLA changed the calculation of the mandatory date a shipment must be offered to transportation (MDT). Table 4 shows the IPG, TP, corresponding requisition priority designators, and the processing days allowed by UMMIPS standards. The entries in parentheses show the processing timeframes now being used by DLA depots as a result of the automatic downgrading policy.

Once the MDT has been calculated, DWASP checks the inventory record, and if the on-hand quantity cannot support the request, a denial notice is produced and the requisition

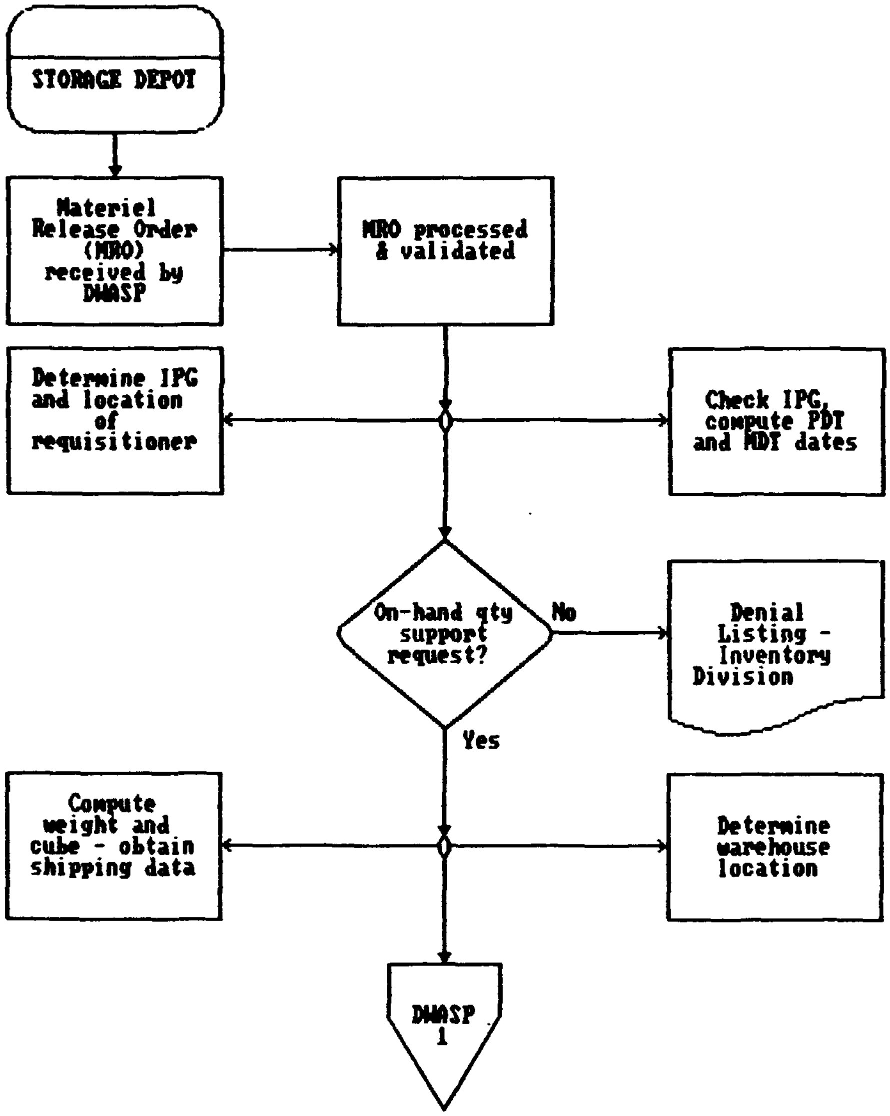


Figure 18. Depot - DWASP Preliminary Processing

status is passed to DPSC and DAAS at end-of-cycle processing. The most frequent reason for denial of medical items is shelf life. This is because the shelf life for the item requested and the items in stock are not identical. The Standard Automated Materiel Management System at DPSC which passes MROs to the depot does not have visibility over shelf life (Broniak, 1991).

DWASP automatically computes the size and weight of the item when packaged and identifies its location in the

TABLE 4

UNIFORM MATERIEL MOVEMENT AND ISSUE PRIORITY SYSTEM

MILITARY SUPPLY AND TRANSPORTATION PROCESSING TIMEFRAMES

Issue Priority Group (IPG)	Transportation Priority	Priority Designator	Processing Days Depot	Processing Days Transportation
1	1	01-03	1	3
		(JCS Project)	(1)	
		(Pharmaceuticals)	(2)	
		(Other TP 1)	(3)	
2	2	04-08	2 (3)	6
3	3	09-15	8	13
		(Processing combined)		(21)

(Modified from Table 2)

warehouse. A mode of transportation is preselected based on weight and cost. As shown in Figure 19, MROs with TP 1 or 2 flow through the system automatically; TP 3s are placed in an eight-day bank so that those with common destinations can be consolidated (Broniak, 1991).

Warehouse Processing. DWASP normally releases MROs from the bank daily by geographical area to ensure those with common destinations are released at the same time. Those MROs released for that day plus those in the system with TP 1 or 2 become the daily workload. When the MROs are released, DWASP automatically sorts and prints the pick ticket for warehousing and downloads records to Integrated Materiel Complex (IMC) control. The IMC is an automated warehousing system that controls data and materiel flow, eliminating paper until the point of marking for shipment. Warehousing picks and packs the order, making MRO quantity adjustments and performing denial research as necessary. Individual packages are consolidated into boxes, crates, pallets, as appropriate, and the DD Forms 1348-A, DOD Single-Line Item Release/Receipt are printed. The transportation mode is finalized based on cost comparison of eligible carriers, and the materiel is offered to transportation.

Transportation Processing. DWASP passes the computed shipping information to the Mechanization of Freight and Shipping Terminal (MOFAST). Based on the transportation

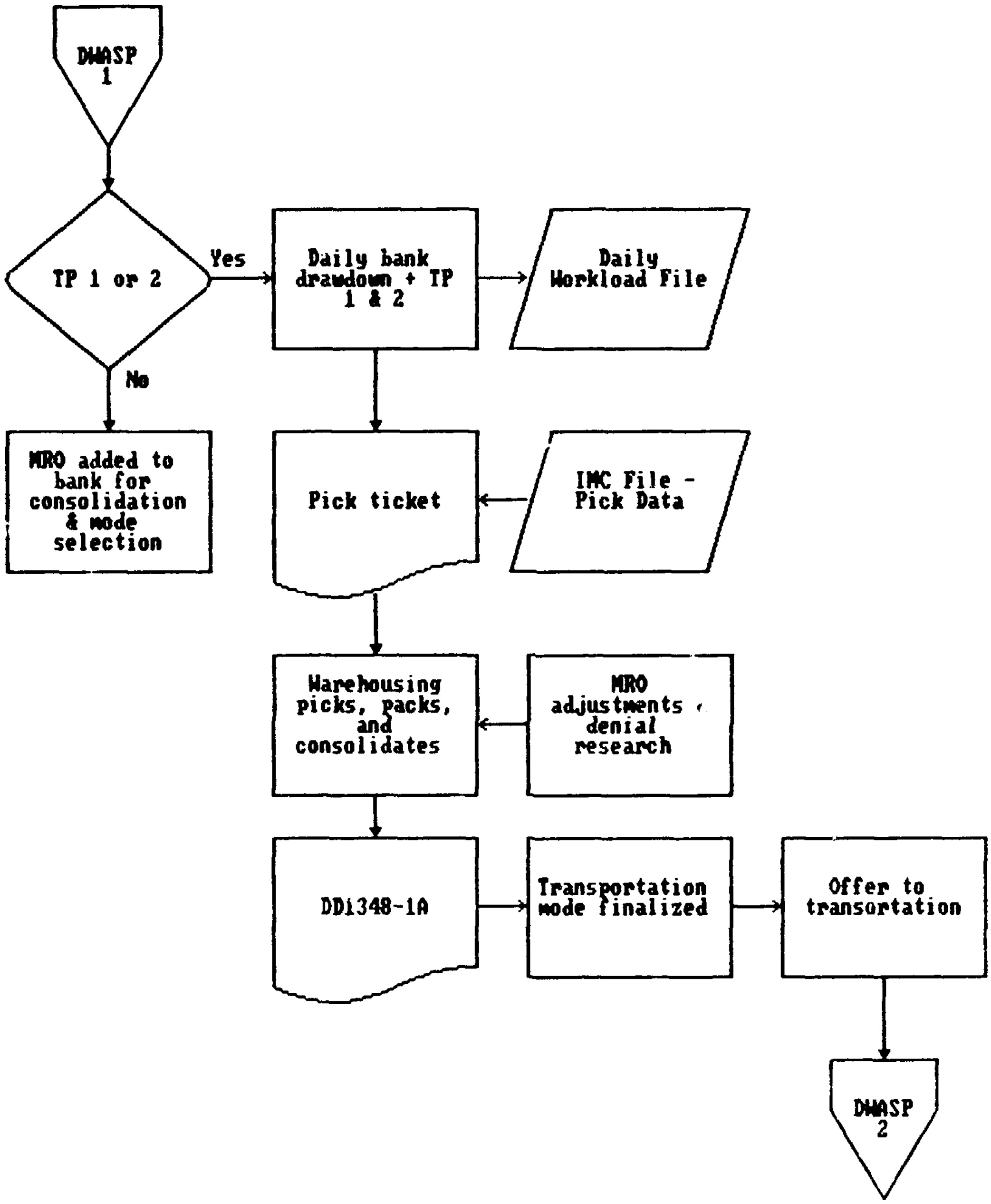


Figure 19. Depot - Warehouse Processing

priority assigned to the requisition, the materiel may be sent by truck, parcel post, express mail etc. Items are shipped according to their priority by the fastest, most economical form of transportation (Pierce, 1991). A high priority requisition generally will leave the depot a few hours after the MRO is received (Hq DLA, 1990).

Figure 20 shows the flow of data once DWASP has passed the shipping information to MOFAST. Once the shipment is ready, transportation personnel update MOFAST with actual ship date and selected carrier information, and the bill of lading is printed. The carrier picks up the materiel and proceeds to deliver the item and its accompanying shipping document to its destination. MOFAST updates DWASP upon pick up of the shipment, and at end-of-day processing, DWASP passes requisition status to the customer through DASS and shipment confirmation transactions to DPSC via AUTODIN (Broniak, 1991).

Communication Among the Components

> The order processing and information system form the foundation for the logistics and corporate management information systems. The speed and quality of the information flow has a direct impact on the cost and efficiency of the entire operation. (Stock and Lambert, 1987:499)

As revealed in the process description of each of the major components in the medical supplies pipeline, there are no direct lines of communication (interface). The customer (or supply custodian) who first identifies a requirement

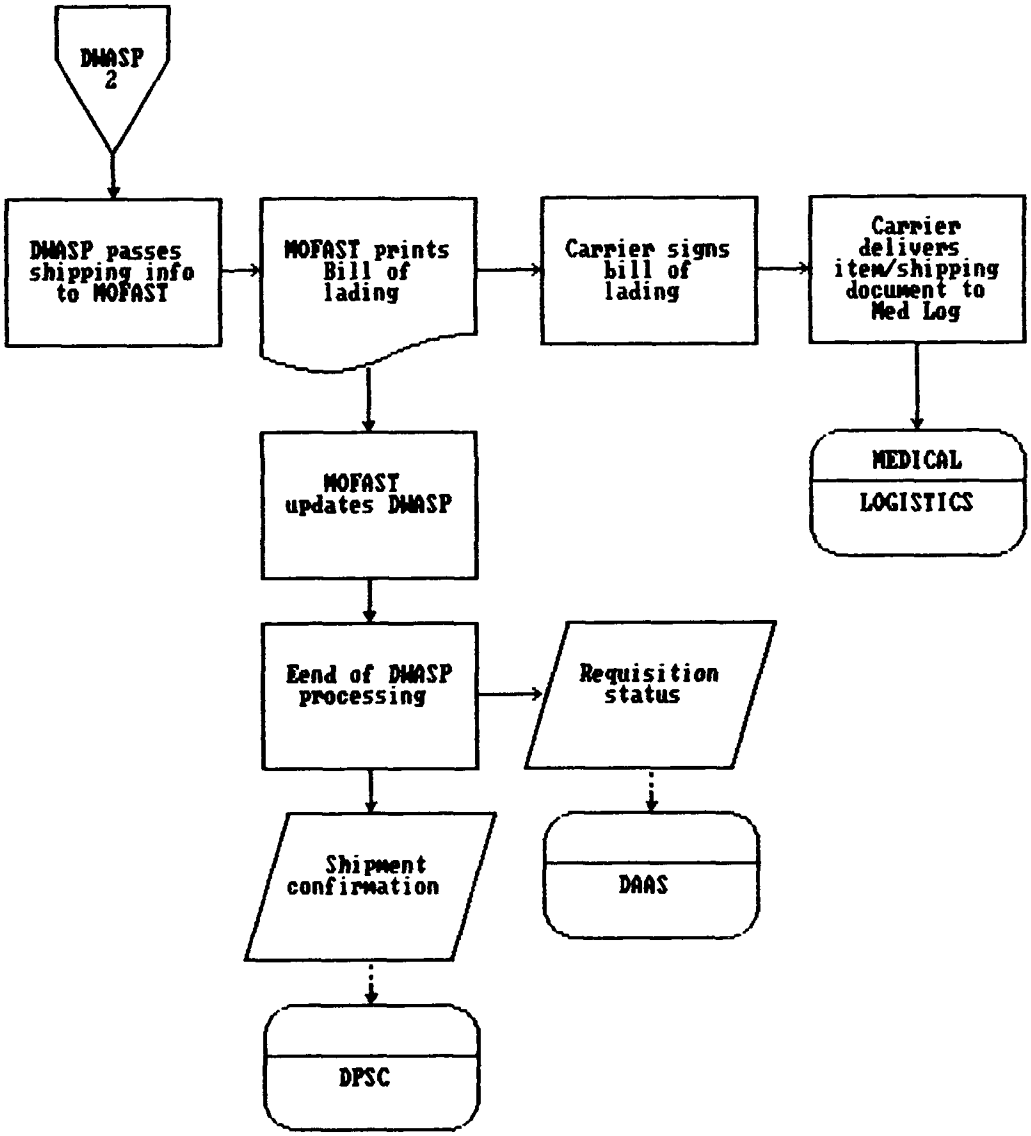


Figure 20. Depot - Transportation Processing

does so to Medical Logistics via the telephone or a piece of paper. Medical Logistics satisfies the requirement or generates a requisition in MEDLOG which is copied to a diskette and handcarried to the Base Communications Center. There the center processes the transactions into AUTODIN format, and they are transmitted to DAAS (See Figure 21).

DAAS (Defense Automated Addressing System) is an automatic data processing center whose function is to route requisition transactions for the services and other federal agencies. DAAS has the capability to validate and edit requisitions, and by checking the national item identification number (the last nine digits of the NSN) of the item being requisitioned, forward it to the current source of supply. It is the mission of DAAS to pass routine requisitions within one hour of receipt and priority requisitions within ten minutes (Littlejohn, 1991).

Requisition transactions leave DAAS for DPSC again via the AUTODIN system. Requisitions for stocked items received at DPSC are processed in SAMMS, and materiel release orders are passed to the storage depot once again through the AUTODIN system. Once the depot has picked, packed, and shipped the order, a shipment confirmation transaction is passed to DPSC and the customer via AUTODIN, and the customer's requisition is closed.

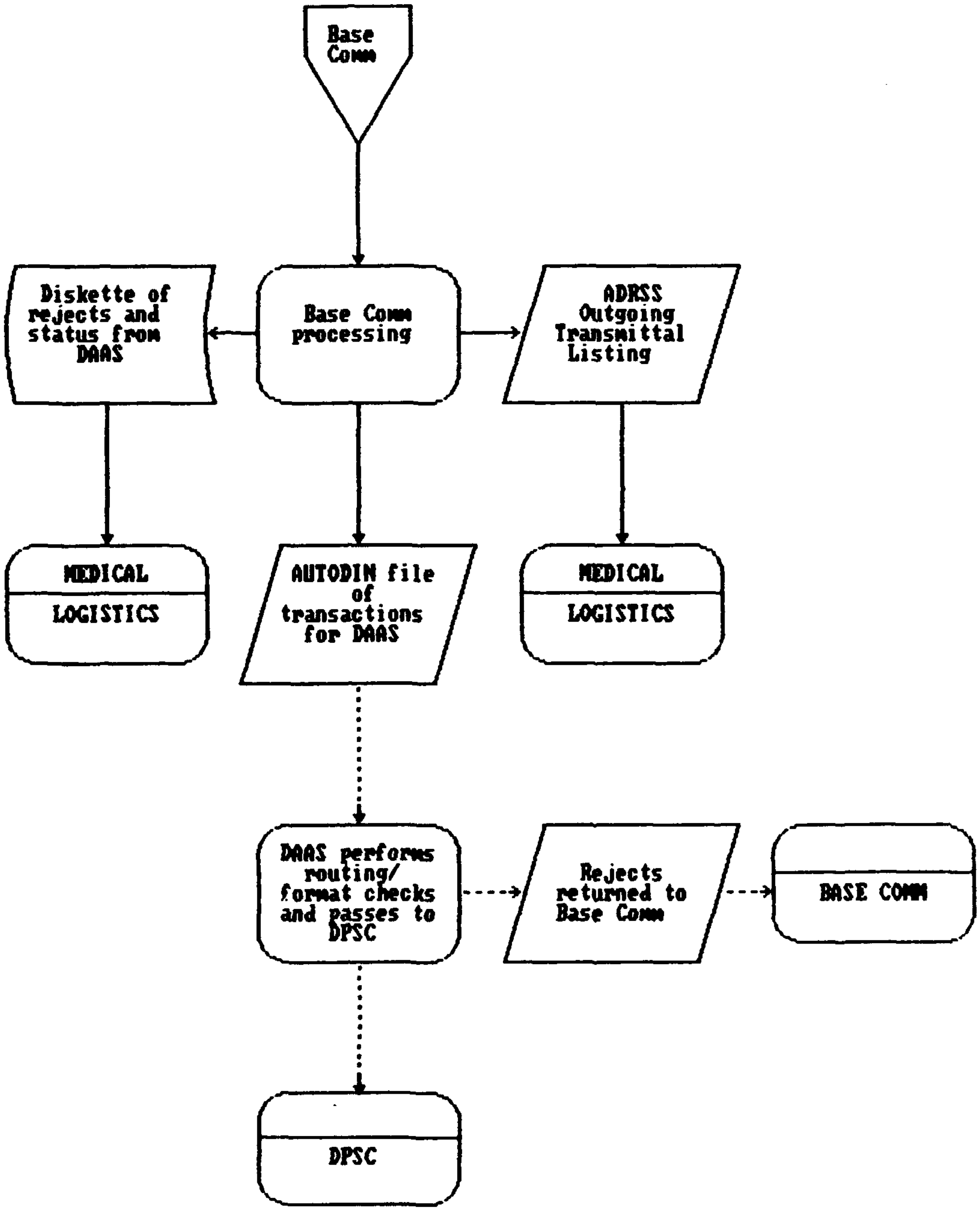


Figure 21. Communication Among the Components

Requisitions for non-stocked items flow through the contracting process, and eventually are passed on to a vendor via electronic, telephone or mail ordering.

Summary

The flowcharts and process descriptions presented in this chapter defined and documented the order cycle process used by Air Force customers of DLA to satisfy their medical supplies requirements. There are several paths a customer's order might follow, and the flowcharts presented a visual reference and illustrated the complexity of the process. Research revealed there are four major functional/ organizational areas within the medical supplies pipeline: the customer, Medical Logistics, DPSC, and the storage depot. The inter-relationships of the functional areas within the pipeline are crucial to process performance and customer satisfaction, yet the research revealed none of the systems used in the order cycle interface directly. That is, vital communication links are weak.

The descriptive nature of this research allowed personal insight and judgment to be used to define the process. As Schendel and Cool explained, the results of this effort should advance research in the logistics field and could serve as tools for hypothesis testing (1988:28).

Chapter V examines how the medical supplies requisition process is managed to ensure it meets the identified objectives. In this manner, the two remaining investigative questions are answered. The chapter also presents the conclusions of this research and recommendations for policymakers and practitioners and future study.

V. Findings, Conclusions, and Recommendations

Introduction

This research effort examined the process used by the Defense Logistics Agency (DLA) to provide medical supplies to its customers. The flow of information in the medical supplies pipeline was followed from the determination of a requirement to item receipt. The "customer" for this study was identified as an activity within a medical facility, a laboratory, a Guard or a Reserve unit, or any activity with a valid requirement for medical supplies supported by Medical Logistics on an Air Force base. The objective of this effort was to document the process; and in so doing, five major investigative questions were examined.

Chapter IV contains flowcharts and a detailed narrative description of the process used by Air Force activities to requisition medical supplies from DLA. In developing that chapter, Investigative Questions 1 - 3 were answered. This chapter addresses the last two investigative questions posed in Chapter I. The answers to those questions together with the process descriptions and flowcharts presented in Chapter IV provide an answer to the specific issue identified for this study:

> What is the process used by the Defense Logistics Agency (DLA) to provide medical supplies to its customers?

Findings

The findings are described in order of the presentation of the investigative questions. The reports and measurements described below do not represent all of the tools used to manage the medical supplies pipeline, but are representative of the ones cited most frequently by the technicians and managers interviewed.

Investigative Question 4. What are the objectives of the process and how are they measured?

The definition of process applicable to this study is one offered by Gitlow et al.: A process is the transformation of inputs into outputs involving "the addition or creation of value in one of three aspects: time, place, or form" (1989:38). In a logistics context, this means materiel is available when, where, and in the form it is needed. The particular process scrutinized in this study was the requisitioning of medical supplies, and the order processing system used by DLA to serve its customers.

According to Stock and Lambert, the basic function of an order processing system is to provide a communication network that links the customer and the supplier (1987:505). The process descriptions and flowcharts for the components in the medical supplies pipeline indicate the system also communicates information useful for forecasting requirements, planning, scheduling, workload analysis, etc.

This study identified four major components involved in the process of requisitioning (order cycle) medical supplies: the customer who provides the input (requisition/order for medical supplies), Medical Logistics which either fills the order (output) or passes the requisition to Defense Personnel Support Center (DPSC), DPSC which either directs one of the DLA depots to release the requested item (output) or initiates a purchase order to obtain the item (In that instance, a supplier would deliver the output--usually not to the requesting customer, but rather to some point identified in the order), and the storage depot which ships the item (output) to the customer. The process described provides a specific contrast to the generic one posed by Stock and Lambert in Figure 2 where the customer and supplier are clearly defined (1987:504). The order cycle for medical supplies involves Medical Logistics as both a supplier and a customer.

The members of the customer service Quality Management Board (QMB) at DLA cited the purpose of the medical logistics system as providing "the right material, at the right place, at the right time, at the right cost" (Brennan, 1990). This purpose is consistent with the primary objective of the Medical Logistics Office: "to provide outstanding logistic support for the missions assigned Air Force medical treatment facilities" (Peedin, 1989:2).

The mission of the Directorate of Medical Materiel at DPSC is to provide medical materiel to all military services and various civilian federal agencies, and an objective of the depot is to ensure the medical materiel is picked, packed and transported to the customer within the timeframes dictated by the Uniform Materiel Movement Issue Priority System (UMMIPS) (DPSC, 1991).

Defense Logistics Agency and Air Force regulations and management reports were examined, and questions were posed during interviews to determine how the process is being measured to ensure the medical logistics system meets the objectives identified. The results are contained in Table 5, and are discussed in the following paragraphs.

The medical supplies requisition flow shown in Figure 9 began with a customer (e.g., an activity in the medical center) who places orders for medical supplies with Medical Logistics. The system used by Medical Logistics (MEDLOG) monitors item demand and produces Issue Backorder Lists so customers can confirm receipts and see what was not available. It is Medical Logistics responsibility to meet the needs of its customers; the customers cannot go to another source. Therefore, customers monitor the reports produced by MEDLOG, and inform Medical Logistics when there is a problem.

TABLE 5

FUNCTIONAL OPERATIONS MEASUREMENTS

Component/Report	Function Concern	Factors Considered
Medical Logistics		
-Monthly Stock Status Report	Pipeline time	Deviations to norm
-Requisition Trouble List Daily/Monthly	Out-of-stock situations	On-hand balance less than safety level, shipping status has not been received
	Delinquent shipments	Shipping status has been received
DPSC		
-Monthly Workload Performance Report	Gross demands	Stocked, non-stocked, non-NSN
	Backorders	Age, total lines
	Stock availability	Items available first time req processed, total stock, FSC 6505
	Contracting Workload	PR lines, age, awards, leadtime
	Complaints	Total customer, depot, quality, discrepancies
	Requests for NSNs	Received, completed, age
	New item entry	Time segments - requirement to award
	Awards by service	Dollar, monthly, fiscal year
Storage Depot		
- Workload Analysis Daily/Monthly	MRO lines shipped	Commodity, IPG
	Denials	Rate by commodity

TABLE 5 (Cont)

FUNCTIONAL OPERATIONS MEASUREMENTS

Component/Report	Function Concern	Factors Considered
	Receipts	Returns, redistribution procurement
	MROs offered	% by IPG and commodity offered on time
	Lines offered not shipped	Days
-Workload Released by Mode - Monthly	Transportation mode	Lines by commodity by mode
	Locator record accuracy	
	Shipping effectiveness	Total processing/ transportation time

The primary concern of Medical Logistics is to ensure stock is available when needed. As a customer of DPSC, Medical Logistics must know how long it takes for an order to be filled; therefore, MEDLOG, the system used by Medical Logistics, measures the total order cycle, or total pipeline time. When a receipt from the depot is entered into the computer, the system automatically computes the pipeline time by subtracting the present date from the date of the requisition. The system then uses the pipeline time to determine when orders should be placed.

As a supplier in the medical supplies process, Medical Logistics is more concerned with avoiding out-of-stock situations. There are several MEDLOG products which may be used to manage item availability. One of the primary products, the Requisition Trouble List, consists of several parts. Part I of the report identifies items whose on-hand balance is less than the safety level, and sufficient quantities are on order. Part II identifies requisitions that require follow-up action because shipping status has not been received, and Part III list requisitions having a delinquent shipment status (Peedin, 1989).

As the inventory control point for medical items, the Directorate of Medical Materiel at DPSC is concerned with the efficiency of all the functions related to inventory control, such as cataloging, requirements determination, procurement, distribution, etc. There are numerous daily, weekly, monthly, and yearly reports which are used to measure the performance of those functional areas.

One such report, the Monthly Workload Performance Report, is used primarily to measure how effectively the Directorate is meeting the objectives of the medical supplies requisitioning process. As can be seen in Table 5, there are two statistics, backorders and supply availability, which are of particular interest in the order cycle (all categories contained in the report are not included in the table.). Other categorical measures may effect the order cycle for medical supplies, but are not a measure of a function in the pipeline (e.g., complaints or contracting workload).

The report graphs the total number of requisitions which have backorders and the age of the requisitions (i.e., 1-30 days, 31-90 days, and greater than 90 days). Supply availability is graphed in two charts: one for total stock availability and one for pharmaceuticals. Supply availability represents the percentage of requisitions received by DPSC which were filled from depot stocks the first time the requisitions were processed through the system (DPSC, 1991). Of the 1.68 million requisitions received by the Directorate of Medical Materiel at DPSC in fiscal year 1990, 90.2 percent were filled on the first pass. The DLA supply availability goal is 89 percent (DPSC, 1991).

The final component involved in the order cycle for medical supplies is the storage depot. Just as the previous components have numerous reports which measure their performance in meeting the objectives, so too does the storage depot.

One report which reflects performance of a storage depot function important to order processing is the Daily/Monthly Workload Analysis Report. Among other functional measures, the report lists denial rates by commodity for the particular depot. A denial occurs when DPSC records indicate there is stock on hand to satisfy the requisition and an MRO is sent to the depot, but the depot does not fill the request. Frequently the reason for denying to fill a requisition for medical items is shelf life. The DLA denial rate goal is less than .8 percent. The MRO fill rate for FY90 at Mechanicsburg, the location of one of the depots with medical supplies, was 99.4 percent, indicating a denial rate better than the goal (Broniak, 1991).

Numerous other categorical measurements are included in the daily/monthly reports, however, denial rate is the functional measurement which impacts the order process cycle for medical customers.

Investigative Question 5. Are there performance standards, and how does current performance compare to those standards?

The effectiveness of order processing may be measured through an analysis of the mean length and variability of the total order cycle, as viewed from the customer perspective. To control the order cycle each of the components of the process must be effective in meeting established standards (Coyle et al., 1988:499). To ensure there is quality in the order cycle process, Novack argues that customer defined characteristics important to the process must be measured. This means establishing standards which agree with the customer's definition and measuring process performance against those standards (Novack, 1989a:24).

The purpose of the Uniform Materiel Movement and Issue Priority System (UMMIPS) is to ensure requisitions receive the proper ranking based on the importance of the requestor's mission and the urgency of need for the materiel. Further, UMMIPS prescribes incremental time standards for requisition processing and materiel movement (DAF, 1989:8-7). The time standards applicable to the requisitioning process are contained in Chapter II, Table 2. In Table 6 the portion of the UMMIPS standards for CONUS

TABLE 6

A COMPARISON OF UMMIPS TIME STANDARDS
AND AVERAGE TOTAL ORDER CYCLE

UMMIPS TIME STANDARDS				AVERAGE TOTAL ORDER CYCLE
Time Segment	Time Standard (days) Priority Designators			
	01-03	04-08	09-15	
Requisition submission	1	1	2	3
Passing Action	1	1	2	1
Inventory Control Point availability determination	1	1	3	1
Storage Site Processing	1	2	8	1
Transportation Hold and Intransit to CONUS customer	3	6	13	3
Requisitioner receipt action	1	1	3	1
Total	8	12	31	10

(Modified from Table 2 and Figure 3)

bases and the average order cycle times experienced by manufacturers (taken from Figure 3, Chapter II) are compared.

Note that for priority 1-3 and 4-8 requisitions the total order cycle under UMMIPS time standards are close to the average total order cycle times experienced by manufacturers (8 and 12, respectively, as compared to 10 days). However, time standards for routine requisitions versus average total order cycle (31 compared to 10 days) are not comparative.

Since UMMIPS is considered fundamental to the operation of the DOD Military Standard Requisitioning and Issue Procedures (MILSTRIP) and most military logistics systems, it seemed appropriate to investigate how many of the time segments were being measured for the medical supplies pipeline. The UMMIPS segments include: requisition submission, passing action, inventory control point availability determination, storage site processing, transportation hold and intransit to customer, and requisitioner receipt action. Table 7 lists the segments which are being measured for the medical supplies pipeline (order cycle) for stocked items by the individual components involved in the process.

MEDLOG, the requisition processing system used by Medical Logistics, computes the total pipeline time for each

TABLE 7

MEASUREMENTS OF THE PIPELINE TIME

COMPONENT	PORTION OF PIPELINE MEASURED	FACTORS MEASURED
MEDICAL LOGISTICS	Total pipeline time	Requisition date to receipt processing
DPSC	Center processing time	Requisition receipt to passing MRO - stocked items only
STORAGE DEPOT	Shipping Effectiveness	MRO receipt to delivery at requisitioning installation

requisition as previously explained. Depending on the requirement code for the particular item, up to six "times" are used to compute an average pipeline time for a particular item. Variability is not computed for each requisition. However, the Monthly Stock Status Report list items ordered which experienced deviations from the average pipeline time greater than 15 days.

Management reports revealed that the portion of the pipeline measured by the Directorate of Medical Materiel is the inventory control point processing segment for stocked items. This segment extends from the date the requisition is received to the date that a materiel release order is transmitted to the storage site. For FY90, 96.4 percent of the requisitions for medical items arriving at DPSC resulted in MROs being transmitted to the storage site within the standards established by UMMIPS; the DLA goal is 96 percent (DPSC, 1991).

At the storage depot "shipping effectiveness" is measured. Until 30 June 1991, the UMMIPS depot time segments (i.e., depot processing, transportation hold and CONUS intransit) were combined for processing of routine requisitions (priority designators 09-15). To affect the combination, each DLA depot developed a standard depot processing time (picking and packing) based on experience, normally two days. Internal transportation processing (shipping documentation processing and vehicle loading) was allowed two days, and an average transit time to CONUS destinations were compiled.

Monthly shipping effectiveness was computed based on the receipt date of the MRO, and verification from a carrier that a shipment had been delivered. Although verification is required for all shipments, a random sample of five percent was used to determine if requisitions were delivered within the UMMIPS standards. As of 1 July 1991, each Department of Defense agency is responsible for developing its own method of measuring the intransit portion of the pipeline (Jenkins, 1991). The DLA goals for shipping effectiveness are 99 percent for Issue Priority Timeframe Groups (IPG) 1 and 2, and 95 percent for IPG 3 (Broniak, 1991).

Conclusions

Once a process is understood, it is easier to manage and to take action to improve it. Descriptive in nature, this study provided the framework for understanding the medical supplies pipeline from an Air Force perspective. The research conclusions are discussed in order of the presentation of the investigative questions used to define and document the process.

Investigative Questions 1 - 3.

1. What offices and organizations are involved in the medical supplies pipeline?

2. What is the flow of the process and what are the boundaries?

3. What are the procedures followed in the requisitioning of medical supplies?

Research revealed there are six organizational components involved in the medical supplies pipeline: the customer, Medical Logistics, Base Contracting, the Defense Personnel Support Center (DPSC), a storage depot, and vendors. The focus of this thesis was on the four major components: the customer, Medical Logistics, DPSC, and the storage depot. The latter three each have subsections or branches responsible for the specific tasks within the component.

As illustrated in Chapter IV, requirements for medical supplies originate with the customer and are passed to Medical Logistics. Medical Logistics either satisfies the requirement from on-hand stock or passes a requisition to

DPSC for depot-stocked items. If Medical Logistics is located on a stateside base, and the requirement is for a non-stocked item not covered by a blanket purchase agreement, Base Contracting becomes involved in the process. If Medical Logistics is outside the continental United States, DPSC performs the local purchase functions, and the requirement is passed in requisition format through AUTODIN.

For depot-stocked items, the Standard Automated Materiel Management System (SAMMS) at DPSC passes a materiel release order (MRO) to the storage depot serving the geographical area of the requesting Medical Logistics office, and the storage depot picks, packs, and arranges transportation for the order. A carrier delivers the order to the location identified, and once the item reaches Medical Logistics, it is passed on to the customer.

If the requirement is for a non-stocked item, DPSC first attempts to make the purchase through its automated systems. If an automated purchase is not successful, a buyer manually processes a purchase request, and the item is eventually delivered to the customer.

If these conclusions had been written prior to June 1991, the duplication of processing for local purchase requirements would have been identified. However, the recent decision at DPSC to provide local purchase services to all customers should eliminate that duplication.

Although Air Force customers with a medical supply requirement are responsible for clearly identifying the need, it should be the goal of the supplier (DPSC) to ensure their customers have the latest information for medical items. Catalogue information in microfiche format is provided regularly by DLA, however, it fails to meet customer needs as evidenced by one use of a contractor supplied database at Wright-Patterson AFB. It does not seem logical that a contractor could provide the information in as timely a manner as DPSC.

It is understood that DPSC plans to offer a catalog in computer disk/read only memory format to their customers in the near future. In so doing, DPSC would provide a tool to make the customer's job easier. In addition, DPSC assigns an average of 600 new stock numbers per month (DPSC, 1991), and that information should be readily available to customers.

To document a process, the owner, an individual responsible for the condition and any changes to the system must be identified (Gitlow et al., 1989:42-43). Owners of the systems used in the medical supplies pipeline (i.e., MEDLOG, SAMMS, DWASP) were identified. However, during the course of this research, no single organization or office was found to either manage or monitor the entire process.

Personnel at DPSC stated that requisitions are received sometimes as late as fifteen days after the document was created, based on document date and date of receipt (Miraglia, 1991). Experience has shown that improvements in the method of order placement result in the greatest possible reduction in order cycle length (Coyle et al., 1988:494). There should be a medical supplies process owner who discovered the reason for this variability.

Although a receipt acknowledgement transaction is automatically created by MEDLOG when the receipt is entered in the system (Dawson, 1991), DPSC personnel stated that very few are received (Miraglia, 1991). Personnel at the Defense Automatic Addressing System Office explained that receipt acknowledgement transactions (D6Ss) normally contain the routing identifier code for DAAS since it is responsible for Military Supply and Transportation Evaluation Procedures (MILSTEP) reporting. Copies of the receipt acknowledgement transactions are forwarded to the inventory control points (Strickler, 1991). A process owner should determine if there is a special problem. That is, the process owner should pursue why the system feedback mechanism does not work.

Investigative Question 4. What are the objectives of the process and how are they measured?

The first section of this chapter provided a detailed discussion of the components of the medical supplies pipeline and their organizational objectives. Members of the customer service Quality Management Board at DLA cited the objective of the medical logistics system as providing "the right materiel, at the right place, at the right time, at the right cost" (Brennan, 1990). DPSC and Medical Logistics, as a supplier, identified similar objectives. The primary means by which these objectives are accomplished is the requisitioning or order cycle process.

According to Stock and Lambert, the basic function of an order processing system is to provide a communication network that links the customer and the supplier. The communication link between Medical Logistics as a customer and DPSC as the supplier needs to be improved.

For a requisition and resulting materiel release order to pass from Medical Logistics to the storage depot, four computer systems which do not directly interface are involved: Medical Logistics (MEDLOG), the Base Level AUTODIN Message Extract System (BLAMES), the Standard Automated Materiel Management (SAMMS), and DLA Warehousing and Shipping Procedures (DWASP). Further, for a requisition to pass through the AUTODIN system, a diskette containing the transaction is handcarried from Medical Logistics to the Base Communications Center. Requisition status is passed from the Base Communications Center to Medical Logistics in the same manner. In this day of electronic commerce, such a step in the process is archaic.

To ascertain the process is meeting its objectives, each component within the pipeline measures those functions which they consider important. These measures reflect function performance for which they are directly responsible.

As a supplier (customer of DPSC), Medical Logistics is concerned with satisfying the requirement and avoiding out-of-stock situations. Knowing when to place an order is of utmost importance, and so the total pipeline time (from date of requisition to date receipt is entered in the system) is measured.

DPSC appears to concentrate on two functional measures to ensure the Directorate is meeting the medical supply needs of its worldwide customers. The number of backorders is graphed and monitored by age, and the supply availability (filling the requisition on the first attempt with no backorders) goal receives daily attention.

The objective of the storage depot is to pick, pack, and transport those items requisitioned by the customer. Once the materiel release order has been received, the function which affects that objective is the denial, not being able to fill the order once it arrives at the depot, so it is measured and monitored by the depot.

Although the functional measurements monitored by those organizations involved in the medical supplies pipeline do affect the system as a whole, no one organization is monitoring the entire process. There is very little centralized knowledge, and certainly no control of the entire process. The expertise and interest expressed by technicians and managers within the individual organizations of the pipeline were extraordinary. However, there does not appear to be a systematic approach to decision and policy making for the process as a whole. For example, the recent decision to issue and ship pharmaceutical products in 24 hours does not appear to have been coordinated with all those involved. Why should the depot work overtime to pick, pack and transport items to a base where the transportation office is not open when it arrives?.

It is not one component of the process, whether it be the inventory control point or the depot, that can satisfy the customer; it must a total process effort. Each component in the process must realize how their actions affect every other component. If each ensures a product with quality (time, form, etc.) is passed on, it will be easier to satisfy the ultimate customer. All components in the process must "breakthrough" the attitude of "functional responsibility," and become concerned with the total process.

To ensure the objectives of the medical supplies pipeline are met, the process must be controlled. For there to be control, there must be an overseer, someone who is concerned with performance of all the components in the process. Further, all those involved in the process should understand how and why the process is being measured. In other words, why it is important to the customer.

Research revealed there are too many links--too many possibilities for system glitches in the process. It should be possible for medical supplies customers to enter their orders directly into the DPSC system. There should be on-line communications between DPSC and at least the larger medical centers.

Investigative Question 5. Are there performance standards, and how does current performance compare to those standards?

The performance standards used by the components (Medical Logistics, DPSC, and the storage depot) are those defined by the Uniform Materiel Movement Issue Priority System (UMMIPS--See Table 2). According to those standards, pipeline segment measurement starts with the date of the requisition and ends with the receipt logged by the requisitioner. Research revealed there are two pipeline standards being monitored by the components of the medical supplies pipeline, and those are the processing times at DPSC and the storage depot. However, those two segments are being measured against a DLA goal rather than the UMMIPS standards.

In addition, the measurements taken are averages, and there are no attempts to identify instances where system behavior differs significantly from what was expected, and where a special problem might exist. W. Edward Deming said a system can best be improved when special causes have been eliminated and the system has been brought into statistical control; then ways to reduce variability are found (Walton, 1988:114). One superintendent at the Wright-Patterson Medical Center stated that if the system were consistent (meaning that if backorders did not occur suddenly for items which previously had not been a problem) he would not have to stock as many items (Dunovant, 1991).

The dictionary definition for standard is "a rule," and for goal is "an aim" (Merriam-Webster, 1976). Why should the DLA goal for segments of the pipeline be less than the standard? It is not clear how this goal was established. Was it developed in concert with DLA customers? Does this goal fall within an acceptable performance range of medical supply customers? As a combat support agency, DLA must be concerned with standards important to its customers.

The Defense Logistics Agency has the resources (PEOPLE) to effectively and efficiently manage and control the medical supplies pipeline. It also has the technology to improve the process. The "SPEDE-medical application is the most advanced and promising EDI procurement application we have found" (LMI, 1990). However, the process must be improved soon, or customers will go elsewhere.

Recommendations

Process improvement can be attained using numerous approaches, and it is obvious the process for requisitioning medical supplies could be improved. Further analysis would be required to identify the most efficient and effective manner to improve the process, however, the following ideas are recommended for consideration.

Policymakers and Practitioners. A review of current literature on order cycle processing revealed EDI is considered the "magic wand" by numerous companies. In fact, one company was able to reduce their entire procurement timeline by 75 percent (Figure 4) by implementing EDI and barcoding. DLA has the capability to be the forerunner for the DOD; EDI implementation should be expedited.

The order placement (requisition passing) portion of the pipeline must be improved. A direct communication link between DPSC and, at least, its major accounts should be developed. Handcarrying diskettes containing requisition transactions from Medical Logistics to Base Communications for AUTODIN transmission does not take advantage of current technology.

Concentrating on one segment of the pipeline will not ensure process performance which satisfies the customer. Therefore, a process owner should be identified. This owner should be someone who becomes concerned with the process as a whole, from requisition creation until item delivery.

This owner also should be responsible for keeping the customers (individual accounts) informed, rather than the services as is done now. Ensuring customers expectations are met should be the goal of the process owner. This assumes customers' expectations are already known.

Personnel working within DPSC and the storage depot should have an understanding of how the process works at each location, e.g., depot personnel should know for sure whether MROs are banked at DPSC, and DPSC personnel should understand how they are banked at the depot. DPSC personnel should understand the effects of their actions (over buying, for example) on depot operations. Understanding the process is crucial for control and improvement. Perhaps job rotations between DPSC and the depots, or a DLA orientation program should be considered.

Future Research. As manpower and funding levels decrease, and it is necessary to do more with less, the medical supplies pipeline must shrink if control is to be established and maintained. The flowcharts and process descriptions could be used to identify steps for elimination or change to shorten the length of the pipeline.

For process optimization, the flowcharts developed in this thesis also could be used by researchers to assess the actual processing times required for each section of the pipeline. These times then could be used to simulate the pipeline or to develop standards for measurement The simulation could be used to demonstrate how changes in each section effect the pipeline as a whole.

It is suggested that the medical supplies order cycle be compared to a system involving commercial customers and suppliers. Such a comparison could provide insight into the costs and benefits of a system which is totally integrated.

Chapter II contains Table 3 which was developed by Dr Robert A. Novack to calculate the sophistication level of control actions being applied to the order cycle and its components. An investigative question of this study examined how the medical supplies pipeline is being measured. The findings revealed very few order cycle processing statistics were compiled. It is Dr Novack's contention that a process should be measured against customer defined quality standards. He points out that once the standards have been identified, they can be measured, and the process can then be improved and controlled (Novack, 1989a:24). It is suggested DPSC and their customers develop meaningful standards for the medical supply requisition process, and that a future study use Dr Novack's table to compute the level of sophistication of the control actions being applied.

Summary

Customer satisfaction was an area targeted by DLA for improvement. To get to know the customers, DLA management decided one of the first steps should be to understand the processes which communicate with the customers. This research effort defined and documented the process used to provide medical supplies to DLA customers worldwide. A user-verified model was presented, and process objectives and performance measurements were discussed. The findings revealed the absence of a process owner and the need for improvement, especially in the area of systems interfaces. It was recommended the implementation of EDI be expedited, and that a future study be accomplished to determine the sophistication of the control actions taken on the medical supplies pipeline.

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Vita

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13. ABSTRACT (*Maximum 200 words*) Defense reorganization initiatives coupled with demands for significant cost reductions exerted tremendous operating pressures on the Defense Logistics Agency (DLA). DLA senior management focused on process management as an approach to simultaneously assure appropriate levels of customer service and cost. The first step in this approach was to fully understand current management processes. As such, the thesis objective was to document the medical supplies order cycle process by tracing the path of information through the logistics pipeline. Detailed flowcharts and narrative descriptions were employed to demonstrate the activities of those organizations responsible for processing Air Force orders for medical supplies. Pipeline objectives and measurements were identified and their implications assessed. The process analysis was facilitated by an extensive literature review of operating policies and in-depth personal interviews with technicians, supervisors, and managers working at all stages of the medical logistics pipeline. Research conclusions included: (1) the absence of a process owner; (2) a weak communications network attributable to poor computer systems integration; (3) key pipeline measurements and management reports focused on functional responsibilities rather than system-wide customer service.

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